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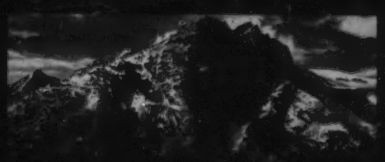
INTERNATIONAL PETROLEUM ENCYCLOPEDIA

Controlling OPEC oil prices 5



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How OPEC oil quotas, production compare

Table 1

	Old quotas		October 1988 production*		1989 quotas	
	Million b/d	% share	Million b/d	% share	Million b/d	% share
Algeria	0.667	4.02	0.7	3.302	0.695	3.76
Ecuador	0.221	1.33	0.3	1.415	0.230	1.24
Gabon	0.159	0.96	0.2	0.944	0.166	0.90
Indonesia	1.190	7.17	1.2	5.660	1.240	6.70
Iran	2.369	14.27	2.3	10.845	2.640	14.27
Iraq	1.540	9.28	2.7	12.736	2.640	14.27
Kuwait†	0.996	6.00	1.6	7.547	1.037	5.61
Libya	0.996	6.00	1.0	4.717	1.037	5.61
Nigeria	1.301	7.84	1.5	7.075	1.355	7.32
Qatar	0.299	1.80	0.3	1.415	0.312	1.69
Saudi Arabia†	4.343	26.16	5.7	26.887	4.524	24.45
U.A.E.	0.948	5.71	2.0	9.434	0.988	5.34
Venezuela	1.571	9.46	1.7	8.019	1.636	8.84
Total	**16.600**	**100.00**	**21.2**	**100.00**	**18.500**	**100.00**

Estimated. †Includes one half of production from Neutral Zone, which averaged 300,000 b/d in October 1988.

Crude prices started to slide again as OPEC members, after four long and often bitter meetings, failed to respond to the non-OPEC offer with new quotas based on a lower production ceiling.

The price of North Sea Brent blend, about $17.50/bbl when the non-OPEC offer of a 183,000 b/d production cut was put to the OPEC consultative meeting, began to drop as it became clear that major exporters were having difficulty matching the offer.

The North Sea marker crude rapidly fell to less than $17/bbl and was heading for the $16/bbl mark. U.S. West Texas intermediate futures for June delivery, after trading at $18.30-18.60/bbl just before the meeting, fell to $17.15-17.30 shortly after talks broke off.

The six non-OPEC members—Angola, Egypt, China, Mexico, Oman, and Malaysia—offered to cut exports 5% in return for a 5% cut by OPEC members, excluding Iraq. The non-OPEC cuts were to have continued through May and June.

The cut would have totaled 183,000 b/d with Mexico providing 68,000 b/d, China 30,000 b/d, Oman 27,500 b/d, Egypt 22,500 b/d, Angola 20,000 b/d, and Malaysia 15,000 b/d.

Reducing OPEC exports by a reciprocal 5% found little favor, but there was support for making more than a barrel-for-barrel response. Iran pushed for a 300,000 b/d reduction with an offer of incentives to persuade the non-OPEC group to draw other producers like Colombia and the Soviet Union into export reductions.

Saudi Arabia, on behalf of the Gulf Cooperation Council (GCC) made up of itself, Kuwait, United Arab Emirates, and Qatar, suggested that the four gulf members cut production by a combined 56,000 b/d. The remaining 127,000 b/d would be allocated equally among eight other members, excluding Iraq.

The majority group had been looking for a bigger contribution from the gulf producers, and the meeting broke up without agreement.

The June 1988 ministerial meeting failed to produce an agreement that could shore up OPEC's ailing prices and production situation.

So the midyear meeting in Vienna was forced to roll over the first half 1988 production and price regime for the rest of the year.

OPEC's drive for market share

Weak oil prices beginning in 1986 reflected a resolve among OPEC members to maintain market share at the expense of revenues.

For example, figures compiled by the Royal Dutch/Shell Group showed that world oil trade remained virtually unchanged at about 24.5 million b/d in 1987, the latest full year for which data are available. That consolidated the sharp increase from 21.9 million b/d in 1985.

Within the 1987 total, OPEC's contribution fell by 500,000 b/d, or 3%, to 15.7 million b/d. Meanwhile, net exports from non-OPEC, non-Communist countries rose to 6.3 million b/d from 5.9 million b/d.

Only about 20% of non-OPEC, non-Communist oil production moves in international trade, compared with more than 80% of OPEC production. As a result, although OPEC's share of international oil exports fell slightly in 1987, it still contributed nearly two thirds of total trade. However, that is well below the OPEC share of more than 90% in 1973, when its exports were about 30 million b/d.

Countries around the Persian Gulf account for the biggest volume of OPEC oil exports, and Saudi Arabia usually supplies the largest share of that oil. In 1987, total OPEC exports from the gulf were virtually unchanged at 10.3 million b/d (Fig. 2).

Outside the gulf, OPEC exports declined to 5.4 million b/d in 1987 from 5.8 million b/d in 1986, with the biggest declines in Nigeria, off 11%, and Indonesia, off 13%.

The main increases in non-OPEC, non-Communist oil exports in 1987 occurred in Norway, with a gain to 850,000

Distribution of oil export revenue loss

Table 2

	Income		
	1985	1987	%
	Billion $		decline
Algeria	9,170	8,000	12.7
Ecuador	1,927	1,350	29.9
Gabon	1,668	950	43.0
Indonesia	9,083	6,144	32.3
Iran	13,115	9,200	29.8
Iraq	11,380	11,300	0.7
Kuwait	9,729	7,800	19.8
Libya	10,520	5,600	46.7
Nigeria	12,338	6,900	44.0
Qatar	3,355	2,100	37.4
Saudi Arabia	25,936	21,500	17.1
U.A.E.	13,395	8,800	34.3
Venezuela	10,325	7,200	30.2
Total	**131,941**	**96,844**	**26.6**

Source: OPEC Review

Where Sabic"s operations are

Table 3

Companies	Location	Feedstock	Products	Capacity (1,000 metric tons/year)	Start-up
PETROCHEMICALS					
Saudi Methanol Co.	Al-Jubail	Methane	Methanol	640	1983
National Methanol Co.	Al-Jubail	Methane	Methanol	770	1984
Saudi Petrochemical Co.	Al-Jubail	Ethylene	Ethane	760	1985
		salt	Ethylene dichloride	560	
		Benzene	Styrene	360	
			Ethanol	300	
			Caustic soda	450	
Al-Jubail Petrochemical Co.	Al-Jubail	Ethylene	Lldpe	332	1984
Saudi Yanbu Petrochemical Co.	Yanbu	Ethane	Ethylene	560	1985
			Lldpe, HDPE	430	
			Ethylene glycol	250	
Arabian Petrochemical Co.	Al-Jubail	Ethane	Ethylene	650	1985
		Styrene	Butene 1	50	1988
			Polystyrene	100	1988
Eastern Petrochemical Co.	Al-Jubail	Ethylene	Lldpe	140	1985
			Ethylene glycol	330	
INTERMEDIATES					
National Plastic Co.	Al-Jubail	Ethylene	Vinyl chloride monomer	300	1986
			Polyvinyl chloride	200	
		Ethylene dichloride			
Saudi European Petrochemical Co.	Al-Jubail	Methanol Butane	MTBE	500	1988
SUPPORT					
National Industrial Gases Co.	Al-Jubail	Air	Nitrogen	146	1984
			Oxygen	438	1985
FERTILIZERS					
Saudi Arabian Fertilizer Co.	Dammam	Methane	Urea	330	1969
			Sulfuric acid	100	
			Melamine	20	1985
Al-Jubail Fertilizer Co.	Al-Jubail	Methane	Urea	600	1983
National Chemical Fertilizer Co.	Al-Jubail	Methane	Ammonia	500	1987
			Compound and phosphate fertilizers	1,300	1988
MINERALS					
Saudi Iron & Steel Co.	Al-Jubail	Iron ore, limestone, natural gas, scrap iron	Rods and bars	1,200	1983
Steel Rolling Co.	Jeddah	Steel billets	Rods and bars	140	1962
GULF INDUSTRIES					
Aluminum Smelter of Bahrain	Bahrain	Alumina	Ingots, rolling slabs, billets, liquid metal	180	1971
Aluminum Rolling Mill	Bahrain	Aluminum	Sheets, corrugated sheets, can stocks	40	1985
Gulf Petrochemical Industries Co.	Bahrain	Natural gas	Ammonia	330	1985
			Methanol	330	

Source: Saudi Basic Industries Corp. 1987 annual report

The success of its venture could spawn similar projects in other nations that have no distribution system or market for their natural gas, Nojaidi said.

"Unless MTBE makers have secure feedstocks, they could find themselves in a bind as methanol operating rates rise and isobutylenes grow scarce."

Sabic unit starts shipments of MTBE

The international flavor of Sabic operations was apparent in start-up of the company's Saudi European Petroleum Co. MTBE plant at Al Jubail, the newest of the parent company's plants.

The 500,000 metric ton/year plant serves markets in the U.S. and western Europe, where MTBE is seeing increasing use as an octane enhancer in unleaded gasoline.

The plant shipped its first cargo Oct. 5, 1988, about 2½ months after start-up. The 20,000 metric ton shipment went to Rotterdam.

Sabic owns a 70% interest in the Saudi European plant, while Ecofuel of Italy, Neste Oy of Finland, and Arab Petroleum Investment Corp., an Arab regional financing firm, each own 10%.

The plant manufactures MTBE via an unusual configuration of technology licensed by Snamporgetti of Italy and the U.S.

Alaskan production.

Except for ANWR, Westermeyer said, the outlook for major North Slope discoveries has dimmed considerably.

Preliminary data from a new assessment by the U.S. Geological Survey and Minerals Management Service (MMS) of undiscovered oil and gas resources suggest that there is less oil likely to be found in Alaska's onshore and offshore areas than was previously forecast.

For the federal Outer Continental Shelf, for example, MMS reduced its estimate of undiscovered, economically recoverable oil to 900 million bbl from 3.3 billion bbl.

Exploration since an MMS assessment in 1985 was disappointing in the Beaufort and Bering seas. Only the Chukchi Sea looked more promising in 1988 than it did in 1985, Westermeyer said.

Prudhoe Bay boost planned

Prudhoe Bay field operators in summer 1988 disclosed plans to begin work on a $350 million expansion of gas handling facilities in the big oil field.

Project goal is to boost production by about 90,000 b/d in 1990, partly offsetting a field decline. The project will hike total field recovery by at least 400 million bbl.

Plans called for the addition of two compressors at Prudhoe Bay's central compression plant (CCP), increasing gas handling capability to 5.1 bcfd from 3.6 bcfd.

The main Prudhoe Bay Unit owners—ARCO Alaska Inc., Standard Alaska Production Co., and Exxon Co. U.S.A.—were studying the feasibility of a further expansion of gas handling capability with a similar project.

A decision on that project could come in 1989, depending on technical factors, world oil prices, and Alaskan taxes.

In addition to boosting oil recovery through improved gas handling and greater use of dry gas for reservoir sweep in a reinjection program, the project will hike yield of miscible gas and NGL for Prudhoe Bay's miscible enriched gas enhanced oil recovery project.

The field's central gas facility (CGF) was handling 3 bcfd of gas and providing miscible injectant for the EOR project and about 40,000 b/d of NGL commingled with Prudhoe Bay crude and shipped through TAPS.

Without the expansion, field production would be limited by capability to handle associated gas. About 10% of the raw gas stream is miscible injectant and NGL, and the rest is sent to the CCP for compression and reinjection into the Prudhoe Bay gas cap pending marketability.

The project's resulting increase in oil production will allow wells to remain on stream longer and thus partly offset the expected natural decline in production.

Compressors will be shipped on the 1990 sealift of equipment to the North Slope. Other work related to the project will involve construction of pipelines to the CCP and CGF and some modifications to increase gas handling capability at Prudhoe Bay flow stations and gathering centers.

Field work was expected to get under way in the 1988-89 winter.

ARCO eyes hike in North Slope reserves

ARCO revealed in April 1988 that it expects to boost its proved North Slope oil reserves by almost 900 million bbl by 1997. In addition, the company said it expects to maintain its North Slope liquids production at more than 425,000 b/d through 1992, 2 years longer than it previously thought.

To achieve those goals, ARCO Alaska was prepared to spend more than $7 billion in the next 10 years, assuming reasonable oil prices and stable taxes.

In the Lower 48, ARCO's liquids production will dip slightly in the mid-1990s, then rebound in the late 1990s. Its natural gas production in the Lower 48 probably will increase slightly in the early 1990s.

In foreign operations, ARCO planned selective expansions, notably in the U.K. North Sea.

However, much of ARCO's upstream emphasis in the 1990s will be on Alaska, which holds 70% of its worldwide liquids reserves.

ARCO's North Slope reserves additions target is a 100 million bbl hike from its 1987 estimate.

The latest estimate did not include reserve additions that may come from exploration or the full potential of West Sak field, where ARCO plans extensive development in the late 1990s.

ARCO booked 260 million bbl of proved oil reserves on the North Slope in 1987.

That broke out to 146 million bbl in Prudhoe Bay field, 144 million bbl in Kuparuk River field, and a loss of 30 million bbl in Lisburne field.

The Lisburne decline occurred because of a reservoir that was not performing as well as expected.

During 1988-97, ARCO will spend about $4 billion for capital items associated with continuing development involving about 1,000 wells—plus continuing enhanced oil recovery efforts—in Prudhoe Bay and Kuparuk River fields and start-up of West Sak.

First phase development of West Sak is to start in the mid-1990s, although expected production levels were not disclosed.

Also on tap was the 1988 start-up of production from the Eileen West End portion of Prudhoe Bay field. Total Eileen development costs will be about $300 million.

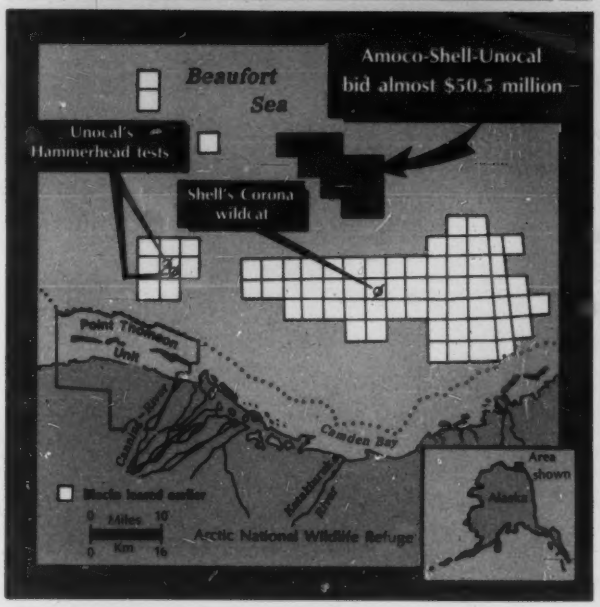
ARCO's reserves share will be about 33 million gross bbl of crude and condensate—already mostly booked as proved reserves—out of Eileen's total contribution of about 170 million gross bbl.

It was prepared to spend another $3 billion on further exploration and development on the North Slope.

ARCO planned to jump its North Slope exploration spending in 1988 to $40 million from $18 million in 1987 and $10 million in 1986.

The 1988 figure was shy of the $78 million ARCO spent for North Slope exploration in 1985.

The sole hotspot in OCS Sale 97 2



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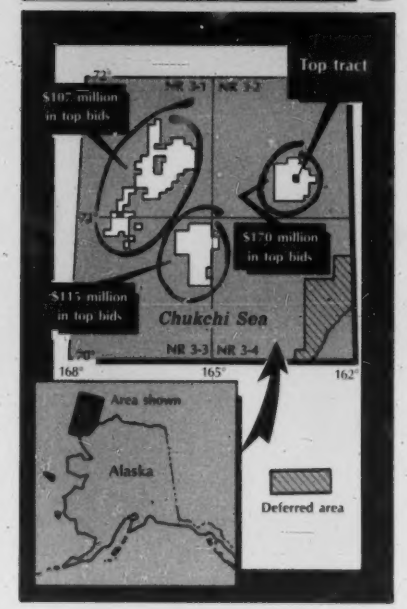


How Angts cost estimates compare

Segment	1982 $ 1982 Baseline	Jan. 1, 1988 $ 1982 Baseline	Jan. 1, 1988 $ 1988 Reestimate	Current $* 1988 Reestimate
	Billion U.S. $ (Billion Canadian $)			
Alaska	14.2 (18.0)	15.6 (20.8)	7.2 (9.6)	10.2 (13.6)
Canada	7.9 (10.0)	8.2 (11.0)	5.6 (7.5)	9.5 (12.7)
Lower 48	2.1 (2.7)	2.3 (3.1)	1.8 (2.4)	2.8 (3.7)
Total	**24.2 (30.7)**	**26.1 (34.9)**	**14.6 (19.5)**	**22.5 (30.0)**

*In service Nov. 1, 1995.

Source: Foothills Pipe Lines (Yukon) Ltd.

Standard's "inverted" Prudhoe Bay wells

Standard's operations in Prudhoe Bay field include a new twist in horizontal drilling: turning the wellbore past 90°. In a report in the Apr. 11, 1988, issue of Oil & Gas Journal, the company called two of its Prudhoe Bay wells, E-28 and E-25, high angle, "inverted" wells.

Standard had drilled 15 horizontal and high angle wells on the North Slope that were producing oil at rates three to four times that of conventionally drilled wells.

In Prudhoe Bay field, the company accessed 800-1,200 ft of Permian Sadlerochit sandstone through slotted liner in long horizontal holes, compared with 50 ft accessed in a vertical well. Sadlerochit is about 9,000 ft deep and 450 ft thick.

Standard tested its E-28 Prudhoe Bay Unit well at a rate of 15,300 b/d of oil, about four times that of a conventional well drilled in similar reservoir conditions.

The inverted wells were drilled vertically, then built angle while penetrating the Sadlerochit. The well path was designed to reach 90° near or just below the base of the reservoir. The wellbore was then turned upward, and the interval to be produced was drilled at an angle of 92-97° (Fig. 1).

The technique leaves a greater distance, or "standoff," between the reservoir gas-oil contact and the well's perforations. That extends the well's long term productivity and practically eliminates gas channeling.

In some cases, the inverted well can be converted to a conventional completion after the inverted interval is abandoned. Standard can maintain the standoff distance from the gas-oil contact as the gas cap expands.

The depth of the contact drops an average 10 ft/year.

Gas coning near the deepest measured depth can be restricted by setting a downhole choke to produce that part of the hole at lower rates.

The company set a cement filled formation packer along the unperforated part of the liner. The packer is insurance against gas from the gas cap channeling along the solid liner toward the perforations in the inverted hole section.

Liner cement jobs have been excellent, practically eliminating squeeze jobs, due to simultaneous reciprocating and rotating during cementing in wellbores inclined as much as 97°.

Standard said rotation mechanically assures that cement reaches under the low side of the pipe and that reciprocation provides fluid velocity and pressure surges to help break up gelled mud in washout zones.

The company had cemented 4 1/2-in. slotted liner in 8 1/2-in. hole, 5 1/2-in. and 7 in. slotted liner in 8 1/2-in. hole, and in one well 4 1/2-in. slotted liner in 6 in. hole.

Standard said costs of its inverted high angle wells in Alaska were no higher than conventional high angle wells at 82°-87°. Slotted liner completions can be used as long as the formation does not contain vertical permeability barriers.

Standard plans second offshore development

Standard in first quarter 1988 started permitting efforts for its second commercial project to produce oil from arctic waters, Niakuk field in the Beaufort Sea.

Niakuk lies northeast of Prudhoe Bay and west of Endicott field, where Standard on Oct. 3, 1987, started the world's first commercial production of arctic offshore oil.

The Niakuk project will cost about $130 million in 1987 dollars. Production is to start in fourth quarter 1991 and reach about 20,000 b/d of oil and 12 MMcfd of gas. Except for field use, the gas will be reinjected.

Plans call for Standard to develop the 58 million bbl, 30 bcf reservoir with 14 producers and injectors, including three existing wells on the Niakuk 4 exploration island. Drilling will begin in early 1991 and take about 13 months.

The project called for expansion of the Niakuk 4 gravel island in 4½ ft of water and linking it to Heald Point with a 1¼ mile gravel causeway. The causeway would have a 350 ft breach to accommodate marine life passage.

Also involved was a new road and pipelines from the tip of Heald Point to Lisburne drillsite L-5 and new pipelines to existing Prudhoe Bay Unit roads from L-5 to either the Lisburne field production center or Prudhoe Flow Station 2.

Standard will have minimodules fabricated in winter 1989-90 and trucked to the island. Niakuk construction, if permits are timely, would begin in winter 1989-90 and take about 22 months.

Standard had drilled nine wells in the Niakuk area since 1985. A 1986 step-out and a 1985 3D seismic survey spurred the development decision.

Niakuk is productive from a faulted extension of Kuparuk River sands. Standard called its sediments highly variable in quality but very permeable in the core development area—in some places capable of producing 5,000 b/d.

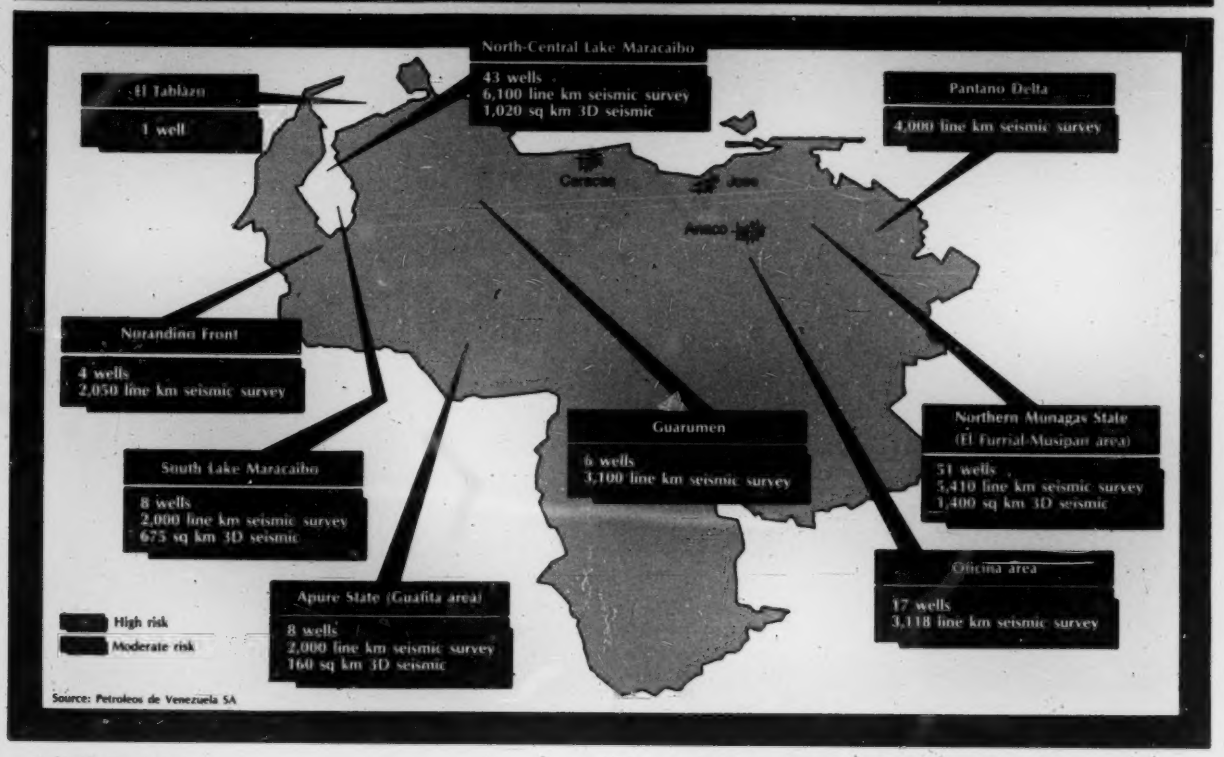
Unocal discovery disclosed off ANWR

Unocal Corp. in May 1988 disclosed a sizable oil discovery off ANWR's Coastal Plain.

The strike buttressed industry's view of the plain's high petroleum potential, which is crucial to efforts to lease and drill there. The well was drilled in the deepest water among disclosed discoveries in the U.S. share of the Beaufort Sea.

Unocal's 1 OCS P-0849 wildcat, a test of the Hammerhead prospect, flowed at a combined rate of 1,580 b/d from

Venezuela's 1988-93 exploration plans



seismic surveys.

Eastern Venezuela focus

Pdvsa officials expect the northern Monagas discoveries to provide all new productive capacity necessary to reach the 3 million b/d target.

At El Furrial, about 18 miles west of Maturin, operator Lagoven SA has identified four structures. It completed two wells in 1986 and three wildcats and four development wells in 1987. It planned five wildcats, seven development wells, and one outpost well in 1988. Six El Furrial wells were producing about 30,000 b/d at midyear 1988. Lagoven expects productive capacity to reach 100,000 b/d by 1990. The company had proved 832 million bbl of reserves by yearend 1987 and expects this to climb to 1.35 billion bbl.

At Musipan, Corpoven SA has drilled two wells and plans a total of 27. Mid-1988 production was 10,000 b/d. A 16 in. pipeline carries El Furrial and Musipan production about 4 miles to old Jusepin oil field, where Lagoven is adding compression to handle associated gas.

It moved four compressor stations from its southern district to Jusepin and planned to be handling 20 MMscfd by midyear. A 30 MMscfd compression unit was to have been, and two centrifugal compressors with nominal capacity totaling about 90 MMscfd are to start up in late 1990. The gas eventually will enter the 900 MMscfd cryogenic complex in Anzoategui to the west. Corpoven sells about 12 MMscfd on the local market, and 20-22 MMscfd is injected at Jusepin.

New life for old fields

Pressure response to the injected gas has revived hope for Jusepin field. Discovered in 1938 with reserves originally estimated at more than 900 million bbl of 36° gravity crude, Jusepin was overproduced during World War II. Flow reached 60,000 b/d, and reservoir pressure plummeted from its original level of about 2,500 psi. Production had been around 300-500 b/d, reservoir pressure 500 psi, with 750,000 bbl of reserves remaining. After injection of about 7 bcf of rich gas from the new fields, however, Jusepin reservoir pressure jumped to 650 psi. Pdvsa officials think the increase may signal potential for improved Jusepin oil recovery. The reservoir has porosity of 36% and permeability of 5-80 md, 40 md in the injection area.

Company affiliates are studying other ways to improve recovery from old eastern Venezuelan light and medium oil fields. One possibility is injection of carbon dioxide extracted from gas handled by the Anaco-Jose cryogenic complex. CO_2 content of the current stream is 6-8%.

Corpoven and Intevep SA, Pdvsa's research affiliate, are performing reservoir simulation studies and laboratory miscibility tests and plan pilot projects in eastern Venezuela in 1989. Pilot injection rates will be about 4.5 MMscfd of CO_2, probably from field extraction units.

Pdvsa envisions commercial CO_2 injection projects beginning in 1994 with injection rates of 10-40 MMscfd.

Submersible pumps also are improving oil recovery. Corpoven has had good results in an old field in Guarico—Budare, discovered in 1958, with about 20 million bbl of reserves remaining from 200 million bbl originally in place.

After working over 14 wells and installing submersible pumps, the company boosted field production to an average 5,500 b/d of 23° gravity crude for the past half year from less than 3,500 b/d before.

Action in the west

Submersible pumps are boosting production in one of the

Breakout of China's energy supply/demand

	Million tons coal equivalent	Coal	Oil	Gas	Hydropower
			Percent share		
PRODUCTION					
1970	309.9	81.6	14.1	1.2	3.1
1975	487.5	70.6	22.6	2.4	4.1
1980	637.4	69.5	23.7	3.0	3.8
1985	855.5	72.8	20.9	2.0	4.3
1987	910.0	72.2	21.0	2.2	4.6
CONSUMPTION					
1970	292.9	80.9	14.7	0.9	3.5
1975	454.3	71.9	21.1	2.5	4.6
1980	602.8	72.2	20.8	3.1	4.0
1985	770.2	75.2	17.0	2.2	4.8
1987	845.0	75.1	17.6	2.3	5.0

Source: Petroleum Industry Research Foundation Inc.

China's oil situation

	Consumption (Million b/d)	Percent growth	Production (Million b/d)	Percent growth
CONSUMPTION, PRODUCTION				
1975	1.34	—	1.54	—
1980	1.75	5.5	2.12	6.5
1985	1.83	0.9	2.49	3.3
1987	2.08	6.6	2.68	3.7
1990*	2.39	4.8	2.89	2.5

	Crude	Products	Total
	1,000 b/d		
EXPORTS			
1983	297	108	405
1984	440	125	565
1985	600	133	733
1986	570	70	640
1987	545	59	604
1988†	530	48	578

*Government forecast. †Estimated.

Source: Petroleum Industry Research Foundation Inc.

the size of an offsetting contract area.

Awarded Contract Area 15/31 consists of all or part of five blocks covering almost 316,000 acres in the Pearl River Mouth basin 95 miles south-southeast of Hong Kong. Exploratory drilling was to begin early in 1989.

The area consists of S 1/2 of 15/31, all of 15/32, 28/01, and 28/02, and N 1/2 of 28/08.

Contract Area 15/33, awarded in 1983, was amended to cover three blocks totaling more than 237,000 acres. Seismic surveys were planned for 1989. As awarded in 1983, the area consisted of four blocks including Block 15/33, and covered about 316,000 acres in 230-330 ft of water. It now consists of Blocks 15/34, 28/03, and 28/04.

Interests in both contract areas are Texaco's Getty Oil International (Orient) Inc. 48.4%, Japex Nanhai (Pearl River) Ltd. 31.3%, and Huanan Oil Development Ltd. 20.3%.

The companies jointly own Pearl River Oil Operating Co. Pearl River is working with Nanhai East Oil Corp., which is responsible for implementing the contracts for China National Offshore Oil Corp.

In 1986 Pearl River's XJ 34-3-1 wildcat flowed 37° gravity oil on two tests at a combined rate of 1,874 b/d with minor gas volumes through a 1 in. choke. The discovery is near a wildcat drilled by the Chinese in 1979. Sun Orient Exploration Co. and Texas Eastern Orient Inc. relinquished their interests in Contract Area 15/33 in 1987.

Some of China's main oil pipelines

Map key	Route*	Diameter (mm)	Diameter (in.)	Completed	Length (km)	Length (miles)	Capacity (Million tons/year)
1	Karamay field-Urumqi	529	21	Jan 1981	293.6	182	4.0
2	Huatugou field-Golmud	under construction			430.0	267	—
3	Daqing field-Liaohe field	720	28	Jan 1971	515.8	321	22.5
4	Daqing field-Liaohe field	720	28	Sep 1974	523.8	325	22.5
5	Liaohe field-Qinhuangdao	720	28	Sep 1973	454.0	282	20.0
6	Liaohe field-Luda	720	28	Sep 1975	436.3	271	23.0
7	Qinhuangdao-Beijing	529	21	Jan 1975	344.6	214	10.0
8	Renqiu field-Beijing	529	21	Jul 1976	144.0	89	10.0
9	Shengli field-Linyie	529	21	May 1978	189.0	117	10.0
10	Shengli field-Qingdao	529	21	Jul 1974	249.0	155	13.0
11	Shengli field-Qingdao	529	21	Jul 1986	246.0	153	16.0
12	Zhongyuan field-Luoyang	273	11	Feb 1985	284.0	176	2.0
13	Zhongyuan field-Linyie	377	15	Jul 1979	242.0	150	5.5
14	Linyie-Yizheng	720	28	Jul 1978	665.0	413	20.0

*Generalized.

Gas/condensate discovery

Esso China Ltd. and Shell Exploration (China) Ltd. tested a gas/condensate discovery east of Hainan Island in the South China Sea.

The companies tested four intervals in the Wenchang 9-2-1 discovery well. Combined flow rate was 25.4 MMcfd of gas and 2,160 b/d of condensate. The best flow from a single interval was 9.4 MMcfd of gas and 1,450 b/d of condensate. More evaluation was needed to determine the accumulation's size, Esso China said. The discovery is in the Contract Area 39/11 extension, 99 miles east of Hainan Island in 387 ft of water. It is the pair's second discovery in the area.

Esso-Shell's Wenchang 19-1-2, formerly 19-1-S, flowed 3,200 b/d of 35° gravity oil in mid-1984. That discovery is in Contract Area 40/01, an east offset to 39/11.

Esso China operates both areas and participates 50-50 with Shell Exploration in partnership with Nanhai West Oil Corp., a unit of China National Offshore Oil Corp.

Another South China Sea strike

The Agip-Chevron-Texaco (ACT) group was to delineate a South China Sea oil strike, which yielded the biggest flow rate disclosed off China.

ACT's Huizhou 26-1-1 wildcat flowed oil from seven zones at a combined rate of more than 26,000 b/d. Individual flow rates ranged from 741 to 5,925 b/d. Oil gravities were 27-40°. The combined flow tops by more than 10,000 b/d the biggest flowing well reported off China, said Kim Woodard, president of Washington, D.C., consultants China Energy Ventures Inc. He estimated water depths in the discovery area at 300-350 ft.

Production from major oil fields

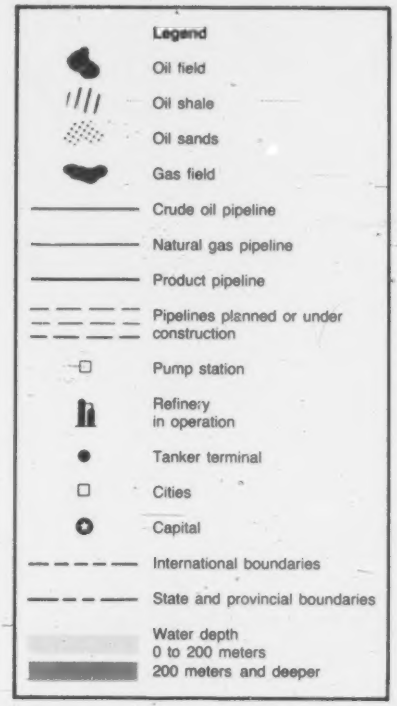
Field	1987 production (1,000 tons)	Percent change from 1986
Daqing	55,550	—
Shengli	31,600	+ 7.1
Liaohe	11,350	+ 13.4
Huabei	7,950	− 20.5
Zhongyuan	6,800	+ 7.9
Xinjiang	5,750	+ 4.5
Dagang	4,170	+ 6.6
Jilin	2,860	+ 20.9
Henan	2,520	+ 0.8
Changqing	1,420	− 1.6
Jianghan	1,010	− 1.9
Jiangsu	625	+ 11.8
Yumen	534	− 2.5
Chengbei	362	+ 62.0
Wei-10-3	353	+126.2

Source: Ministry of Petroleum Industry

Addition of productive capacity

Field	Capacity buildup — 1,000 tons	Volume in new zones — 1,000 tons
Daqing	4,090	—
Shengli	5,440	3,780
Liaohe	2,500	2,500
Huabei	409	409
Zhongyuan	1,500	1,270
Xinjiang	931	616
Dagang	524	373
Jilin	419	318

Source: Ministry of Petroleum Industry



JACK UP works in the Bohai Sea, an area in which China is boosting offshore productive capacity.

China's petroleum exports and trade balance*

	1982	1983	1984	1985	1986	1987	1988	1989	1990	Growth rate 1985-90 (%)
PETROLEUM EXPORT VOLUME (1,000 b/d)										
Crude	293.6	296.6	440.2	600.0	570.0	544.0	552.0	557.0	560.0	−1.4
Daqing	—	—	396.2	480.0	427.5	374.0	345.0	313.3	280.0	−10.8
Shengli	—	—	44.0	120.0	142.5	170.0	207.0	243.7	280.0	+16.9
Products	107.6	107.6	124.9	136.1	109.2	111.0	99.0	83.0	68.0	−13.9
Total	**401.2**	**404.2**	**565.1**	**736.1**	**679.2**	**655.0**	**651.0**	**640.0**	**628.0**	**−3.2**
AVERAGE PRICE ($/bbl)										
Crude	30.30	26.72	25.08	23.97	11.43	16.38	18.25	20.13	21.00	
Daqing	—	—	—	—	12.00	17.00	19.00	21.00	22.00	
Shengli	—	—	—	—	11.00	15.00	17.00	19.00	20.00	
Products	35.42	33.53	29.68	29.15	18.86	22.00	25.00	26.00	27.00	
PETROLEUM EXPORT VALUE (billion $)†										
Crude	3.25	2.89	4.03	5.25	2.38	3.25	3.68	4.09	4.29	−4.0
Products	1.39	1.32	1.35	1.45	0.75	0.89	0.90	0.79	0.67	−15.4
Total	**4.64**	**4.21**	**5.38**	**6.70**	**3.13**	**4.14**	**4.58**	**4.88**	**4.96**	**−6.0**
FOREIGN TRADE (billion $)†										
Nonoil exports§	17.30	17.95	19.65	20.66	27.80	30.58	33.64	37.00	40.70	+13.6
Total exports§	21.94	22.16	25.03	27.36	30.93	34.72	38.22	41.88	45.66	+10.2
Imports¶	18.94	21.32	26.75	42.26	42.90	44.19	45.51	46.88	48.28	+2.7
Net balance	+3.00	+0.84	−1.72	−14.90	−11.97	−9.47	−7.29	−5.00	−2.62	

*Base case. †Current dollars. §fob. ¶cif.

Source: China Energy Ventures Inc. from data supplied by General Administration for Customs of the International Monetary Fund, People's Republic of China State Statistical Bureau, and the National Council for U.S.-China Trade

group was expected to drill its first well early in 1989.

Amoco Orient Petroleum Co. was awarded a 2.19 million acre contract area south of Qinhuangdao in 1987.

Bohai history

BOC technicians used bamboo poles and sent divers to fathom the seabed when the company began operations in 1965. The first encouraging prospects for oil in the Bohai seabed came in 1979 following a geophysical survey of the continental shelf. The state decided to allow foreign participation to gain foreign funds and technology.

BOC signed a contract in May 1980 with Japan National Oil Corp. for joint oil and gas exploration and development in a 9,846 sq mile area of the Bohai Sea.

Before the contract ended in 1987, the venture found oil in 11 of the 16 structures it explored. Of the 35 wells completed by May 1987, 25 are high flowing gas and oil producers.

The contract stipulated that Jnodc would relinquish all contract areas to BOC by June 1987 except 985 sq miles, which it would retain until 1990 for further exploration and appraisal. Work was under way on equipment to develop BZ28-1 and East BZ34-2/4 fields under the September 1987 agreement. BOC has the construction contract for BZ28-1 field equipment, to consist of a $36 million floating production and storage unit.

Bohai-Mitsubishi Corp., another joint venture, was awarded the main construction contract for East BZ34-2/4 field facilities.

Another contract went to SBM, Monaco.

Ste. Nationale Elf Aquitaine drilled three dry holes between 1980 and 1983 in a 3,629 sq mile area and dropped the acreage. Since then it has provided $50 million in loans toward exploitation of West 428 field. Repayment will be in oil.

BOC's growth

BOC, in cooperation with foreign companies the past 9 years, has found 10 fields with a combined productive area of about 30 sq miles.

Reserves of more than 876 million bbl and 212 bcf of gas have been verified. The work is the result of $820 million in foreign investment and brought BOC an additional $620 million in revenue from subcontracting and provision of labor and technical services.

BOC controls 12 service companies that undertake geophysical surveys, offshore drilling, geological services, offshore engineering projects, ship repair, and communications and provide transportation and storage. The companies employ nearly 10,000 persons.

BOC also has established six joint companies with partners from Japan, France, U.K., and Norway. They include China-France Bohai Geoservices Co. Ltd., a joint venture with Geoservice Co. of France; China-GECO Geophysical Co., a joint venture with GECO of Norway; and China Bohai Racal Positioning & Survey Co., a joint venture with Racal Survey of the U.K.

With foreign exchange, BOC has purchased a pipelaying ship, several supply boats, and an oil tanker. It has brought in foreign technology which it is able to offer elsewhere. For example, in Xinjiang Province of Northwest China, the company has a contract to conduct cementing and mud logging for 16,400 ft wells. Overseas, BOC has provided 55 welders to help build offshore platforms in Abu Dhabi.

Pipeline activity

Pipeline construction is growing in China after a lull in the early 1980s.

Work began on a 267 mile crude oil pipeline in western

• Shell Oil Co.'s oil products segment earned $480 million, up from $272 million.

• Amoco Corp.'s earnings from worldwide refining, marketing, and transportation climbed to $631 million from $147 million in 1987.

Lower crude costs also boosted earnings from chemical operations.

These are examples of 9 month chemical profits: Phillips Petroleum Co. $690 million vs. $333 million for the same period of 1987; Mobil $482 million, more than twice the year-earlier net; ARCO $670 million vs. $280 million; Amoco $539 million, up 77%; Shell $480 million vs. $272 million; Texaco $135 million vs. $50 million; Chevron $283 million, up 56.4%; and Exxon $966 million, up $403 million.

Almost all OGJ group companies had lower exploration/production earnings. An exception was Phillips, which posted a gain to $443 million from $234 million a year earlier.

Thirteen of the companies in the group reported capital and exploration expenditures of $19.824 billion for the first 9 months of 1988, up 29.7% from the same 1987 period.

U.S. independent operators, with assets concentrated in oil and gas production, turned in much weaker profit performance during 1988.

In the first half, combined earnings of 138 independents amounted to $2.059 billion, up only 8.7% from first half 1987. By contrast, virtually the same group of producers reported combined profits up 301% for first half 1987.

Industry spending seen as inadequate

The U.S. petroleum industry should have no difficulty funding from internal cash flow a 4 year domestic spending program estimated at $183 billion by Salomon Bros. (Fig. 1).

But it's questionable whether that will be enough to ensure acceptable rates of return or significantly improve U.S. energy security, the New York investment firm said.

Capital spending by oil and gas companies in the U.S. will rise by about 4.8%/year in 1989-90, Salomon Bros. told a December 1988 Arthur Andersen & Co. symposium in Houston. And the rate of U.S. petroleum capital spending growth will more than double to 10.9%/year in 1991.

Although U.S. upstream spending will grow by about 17.9% in 1988-91, it will be outpaced during the period by capital spending for refining, marketing, and pipelines at 22% and for chemicals and other businesses at 40%.

Further, U.S. finding costs won't remain at the low level of 1988 but aren't likely to reach the high levels of the early 1980s. And operators on average probably will replace only about half of their U.S. production in 1989. That will send more exploration dollars abroad.

Salomon Bros. estimated the 8 year average petroleum finding cost in the U.S. since 1980 at $9.80/bbl of oil equivalent (BOE). The marginal cost of developing a barrel of oil in the U.S. from lease purchase through well casing ranged in that period from a high of $13/BOE to slightly more than $6/BOE.

"We observe that finding costs are elastic and depend to a great extent on oil and gas prices," Salomon Bros. said. "The more cash the industry has to reinvest, the higher finding costs tend to run, and vice versa.

"Thus we do not believe that U.S. finding costs are likely to jump back to the $12-13/BOE of the early 1980s because the industry's current level of diminished cash flow cannot support that much waste."

Revisions, or adding reserves via accounting adjustments, contributed 2.5 bbl of oil reserves for each barrel added through drilling in 1987.

Salomon Bros. estimated the structural, or embedded, finding cost in the U.S. at 1988 drilling activity levels at about $8/BOE.

The company estimated that operators will spend $28 billion to acquire leases and develop oil and gas resources in the U.S. in 1989. At $8/BOE, that would yield reserves of

U.S. petroleum industry spending 1

	1988	1989	1990	1991	4 Years
	Billion $				
Upstream related	28	28	30	33	119
Downstream related	9	10	10	11	40
Chemicals and other	5	6	6	7	24
Total	42	44	46	51	183

Source: Salomon Bros. Inc.

ARTIST'S CONCEPT of the Placid Oil Co. group's Green Canyon 29 system in the Gulf of Mexico shows floating drilling/production platform connected to subsea drilling/production template via rigid riser on Green Canyon Block 29, subsea satellite wells on Ewing Bank Block 999 and Green Canyon Block 31, shallow water processing platform on Ship Shoal Block 207, and flow line and export pipeline bundles. Drawing courtesy of Enserch Exploration Partners Ltd. (Fig. 2).

Breakout of capacities

Table 1

	1986 – Million lb/year –	1988 – Million lb/year –
ETHYLENE		
Amoco	2,100	2,280
Aristech	500	—
BASF/UTP/Borg-Warner	750	780
Cain*	—	2,700
Chevron	2,215	2,265
CCPC†	1,400	—
Dow	3,700	4,000
DuPont	1,925	1,000
Eastman	1,300	1,400
El Paso	520	520
Exxon	3,012	3,200
BF Goodrich	350	350
Lyondell	2,800	2,800
Mobil	1,050	1,563
Occidental	275	550
Olin	64	20
Phillips	2,154	2,300
Quantum	2,070	2,175
Shell	4,040	4,040
Sun	225	225
Texaco	1,050	1,185
UCC	2,810	2,810
Vista	650	670
Unannounced and estimated	—	100
Total	**34,960**	**36,903**

	1986 – Million lb/year –	1988 – Million lb/year –
POLYETHYLENE		
Allied	900	1,150
Amoco	350	—
Cain*	940	950
Chevron	1,480	1,495
Dow	2,455	2,520
DuPont	740	740
Eastman	620	620
El Paso	405	505
Exxon	1,190	1,315
Hoechst Celanese	280	310
Mobil	950	1,000
Phillips	1,380	1,430
Quantum	3,245	3,975*
Soltex	1,100	1,200
UCC	2,030	2,130
Westlake	60	460
Total	**18,125**	**19,800**

*Acquired May 2 by Occidental. †Foreunner of Cain.

Source: Bonner & Moore Market Consultants

Partial breakout of U.S. imports*

Table 2

Leading suppliers	Volume (1,000 b/d)	% of total imports	% of products suplied
Saudi Arabia	1,022	14.6	6.0
Canada	979	14.0	5.8
Venezuela	797	11.4	4.7
Mexico	736	10.5	4.3
Nigeria	554	7.9	3.3
Iraq	324	4.6	1.9
U.K.	304	4.3	1.8
Algeria	285	4.1	1.7
Virgin Islands†	222	3.2	1.3
Angola	200	2.9	1.2
OPEC members	**3,358**	**47.9**	**19.8**
Persian Gulf countries	**1,491**	**21.3**	**8.8**

*Crude oil and products, January-September 1988. †Products only.

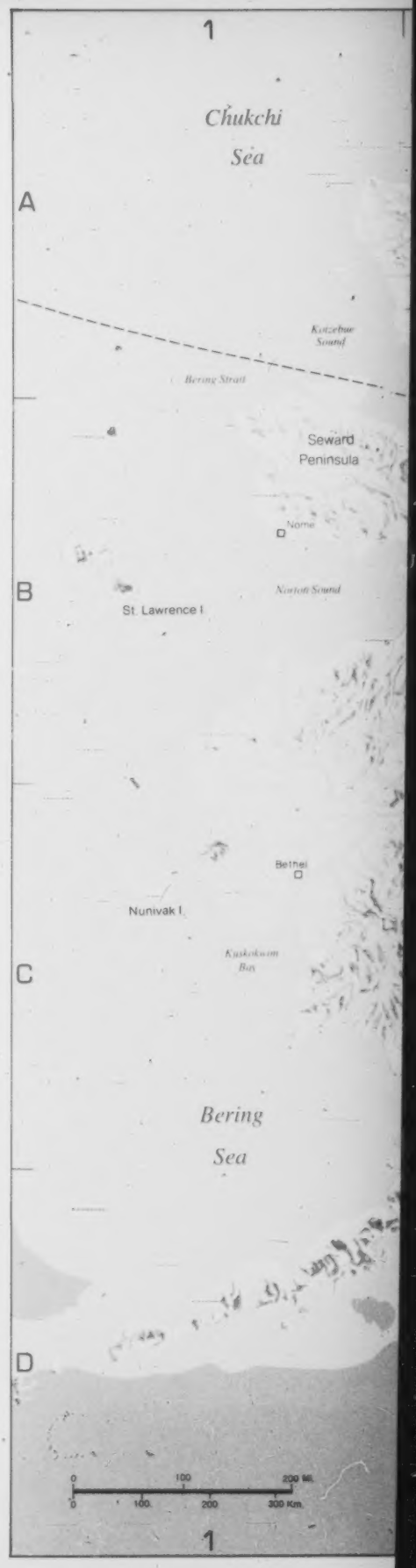
Source: Department of Energy

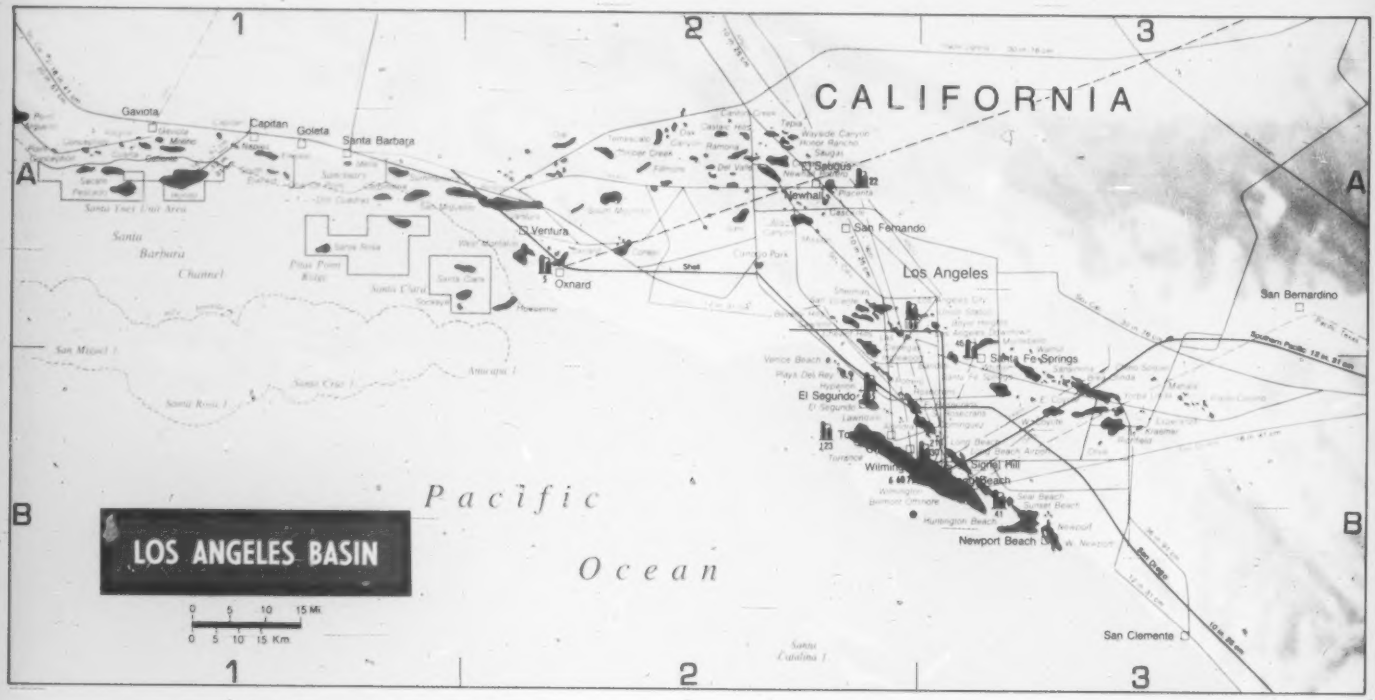
Who got what in Tenneco sale

Table 3

Buyer	Asset	Price (Million $)
Amoco	Rocky Mountain division	900
ARCO	Pacific Coast division	670-700
British Gas	Tenneco Oil International*	194.5
Chevron	Offshore division	2,600
Conoco	Tenneco Oil Norway	115
Fina	Gulf Coast, Southwest divisions	600
J. Philip Handy	Retail marketing division	NR
Mesa	Midcontinent division	715
Mobil	Processing, wholesale marketing	560
Shell	Tenneco Oil Colombia	500
Seagull	Houston Oil & Minerals	56.2
Star Gas	Blue Flame, Greene Propane	NR

*Did not include Norwegian and Colombia exploration/production assets, which were acquired by other companies.





above the subsea template in 1,522 ft of water.

It set the gulf's water depth production record for a surface platform.

Oil and gas production underwent first cut processing on Penrod 72, which was capable of processing 120 MMcfd of gas, 45,000 b/d of liquid hydrocarbons, and 22,500 b/d of water.

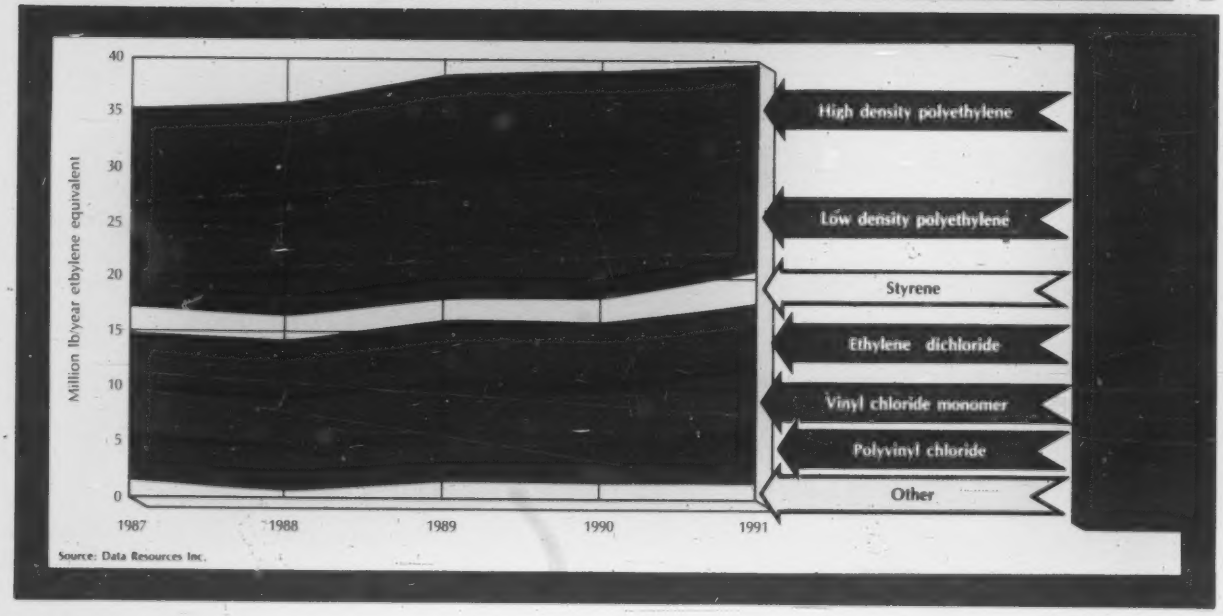
Space was allotted on the semisubmersible for future separation, compression, dehydration, and water treatment equipment.

A 50 mile export pipeline bundle carried oil and gas to a final cut processing platform set in 101 ft of water in Ship Shoal Block 207. Gas was then sold to Pontchartrain Natural Gas System and the oil to JM Petroleum Corp. under 6 month contracts.

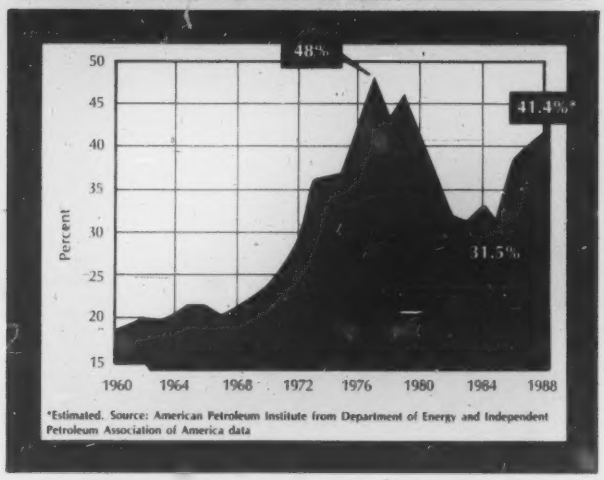
In addition to Enserch, Placid's partners were Louisiana-Hunt Petroleum Corp., Opubco Resources Inc., HI Production Co., Penrod Drilling Co., Petro Hunt Corp., and Prosper Energy Corp.

Exxon took a farmout on all but two of Placid Oil Co.'s

Demand outlook for ethylene by derivative 4



Imports' share of U.S. oil consumption 7



*Estimated. Source: American Petroleum Institute from Department of Energy and Independent Petroleum Association of America data

vanquish the deficit."

DiBona said the federal budget deficit, caused by excessive growth in federal spending and not too low taxes, should be cut by slowing growth in government outlays. If increased revenues still were needed, the fairest choice would be a broad based value added tax, he said.

Merrill Lynch sought to assess the effect of hiking the federal gasoline tax combined with a slowdown in the U.S. economy. The company developed a model that tracked the effects of both events on gasoline demand (Fig. 6).

The model showed that if gasoline prices rose 25% and real disposable income climbed about 2.6%, after rising 3.8% in 1988, U.S. gasoline demand could fall by about 2.5%, or 200,000 b/d in 1989.

Merrill Lynch figured the 25% increase as a 20¢/gal jump in the federal gasoline tax together with a 4¢/gal rise stemming from an expected improvement in oil market fundamentals. The federal excise at the time was 9.1¢/gal for gasoline and 15¢/gal for diesel fuel.

A decline in demand would lessen the pressure on refining conversion capacity, alleviating the supply tightness felt in 1988 and thereby putting pressure on gasoline prices at the refinery gate, Merrill Lynch said. With U.S. oil production on the decline, refiners were increasingly looking to imports to fill a widening supply/demand gap. Data compiled by API showed that U.S. dependence on imported oil stood at 41.4% of 17.743 million b/d of oil demand in 1988, the highest since 1980 and not too much shy of the 48% record of 1977 (Fig. 7). The Department of Energy reported that the biggest sources of U.S. imports in 1988 were Saudi Arabia and Canada, each of which accounted for about 14% of total U.S. oil imports (Table 2).

Oil reserves up, gas reserves down

U.S. oil reserves took a surprising jump in 1987, mainly because of revisions for fields in Alaska. Gas reserves declined again. The Energy Information Administration, in a summary of its annual reserves report, said crude oil reserves were 27.256 billion bbl at yearend 1987, up a net 367 million bbl from yearend 1986 after production of 2.873 billion bbl. The 1.4% increase was mainly due to the largest gross positive revision EIA has recorded: 3.687 billion bbl. Most of that was due to large increases of 1.121 billion bbl from infill drilling, enhanced recovery, and reassessment of Alaskan field performance.

EIA also listed gross increases in the Lower 48, mainly because of expansions in thermal recovery projects for heavy oil in California (505 million bbl) and enhanced recovery projects in West Texas (477 million bbl).

The revisions were supported by improved economics as the average U.S. crude oil price increased to $15.41/bbl in 1987 from $12.51/bbl in 1986. Crude reserves adjustments and revisions added 2.549 billion bbl gross in 1987, nearly three times the 1986 volume and roughly twice the 1977-86 average of 1.426 billion bbl/year. Crude oil extensions, new reservoirs in old fields, and new field discoveries added 691 million bbl in 1987, up from 1986 but still 22% less than the 891 million bbl/year average in 1977-86.

New field discoveries doubled to 96 million bbl in 1987 but were still only 59% of the 1977-86 average of 162 million bbl. More than half of the 1987 discoveries, 58 million bbl, came from Niakuk field in the Beaufort Sea off Alaska's North Slope. Reserves added by extensions, 484 million bbl, were 20% higher than in 1986. New reservoirs in old fields, 111 million bbl, were up 37% from 1986. However, both were substantially below the 1977-86 yearly averages.

Indicated additional reserves, defined as crude oil volumes that may become economically recoverable from known reserves through application of improved recovery methods using current technology, totaled 3.649 billion bbl.

"The presence of large indicated additional reserves in the North Slope of Alaska, California, West Texas, and New Mexico implies that significant upward revisions to proved reserves will continue in the future," EIA said.

Dry gas reserves slipped to 187.211 tcf at the end of 1987 from 191.586 tcf at yearend 1986. As a result, U.S. gas reserves had declined for 6 consecutive years, and the latest 2.3% drop was the largest of that period.

The latest decline resulted from a combination of the lowest total discoveries (7.175 tcf) recorded by EIA, somewhat higher production (16.114 tcf) than in 1986, and a net increase in the 1987 reserve base through revisions and adjustments (4.564 tcf) that was a little lower than in 1986 although still nearly three times the 1977-86 average.

EIA's reserves figure includes 24.6 tcf on the Alaskan North Slope that do not have a market at present. Although producers have removed the reserves from the proved category because they cannot be sold, EIA noted the produced gas created a positive net cash flow from stripped liquids and from use as a fuel in field and pipeline operations. Given the economic production of North Slope gas, EIA chose to retain it as proved reserves.

Total discoveries of dry natural gas were down 20% to 7.175 tcf in 1987, the lowest discovery level during 1977-87. New field discoveries were roughly flat at 1.089 tcf but still 57% lower than the 1977-86 average of 2.539 tcf.

Extensions (4.587 tcf) and new reservoirs discovered in old fields (1.499 tcf) were substantially down in 1987.

"These discoveries reflect exploratory gas drilling that dropped to even lower levels than in 1986," EIA said. "In fact, they were the lowest since 1973."

Reserves of natural gas liquids were 8.147 billion bbl, essentially unchanged from the 8.165 billion bbl at the end of 1986. The first full year of operation for large gas processing plants in New Mexico and on the Alaskan North Slope helped sustain NGL reserves.

Gas markets spark pipeline plans

Growing demand for gas in the U.S. Northeast, Florida, and California spawned a flurry of construction proposals by gas transmission lines in 1988. At yearend, the Federal Energy Regulatory Commission had not sorted out enough proposals in its approval process to set off a wave of pipeline construction.

Construction of crude oil and petroleum products pipelines was barely noticeable when compared with gas transmission activity.

OGJ 400

Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
1	1	Exxon Corp.	74,042,000	1	83,335,000	1	4,840,000	1	33,626,000	1	7,136,000
2	2	Mobil Corp.	41,140,000	2	56,716,000	3	1,258,000	2	16,783,000	3	2,942,000
3	4	Chevron Corp.	34,465,000	4	29,097,000	6	1,007,000	3	15,780,000	4	2,841,000
4	3	Texaco Inc.[1]	34,388,000	3	35,315,000	400	(4,407,000)	6	9,171,000	6	1,990,000
5	5	Shell Oil Co.	26,937,000	6	21,222,000	5	1,230,000	4	14,842,000	5	2,614,000
6	6	Amoco Corp.	24,827,000	5	22,388,000	2	1,360,000	5	12,107,000	2	2,979,000
7	10	BP America[2]	23,287,000	9	15,562,000	7	564,000	8	5,574,000	7	1,549,000
8	7	ARCO (Atlantic Richfield Co.)	22,670,000	8	17,608,000	4	1,244,000	7	5,878,000	9	1,463,000
9	8	Tenneco Inc.	18,503,000	10	14,957,000	398	(218,000)	11	3,773,000	10	1,291,000
10	9	Occidental Petroleum Corp.	16,739,000	7	17,746,000	12	240,000	10	5,164,000	15	757,000
11	13	Sun Co.	12,580,000	14	9,817,000	9	348,000	9	5,229,000	11	1,176,000
12	11	Phillips Petroleum Co.	12,111,000	12	10,917,000	36	35,000	14	1,617,000	16	750,000
13	12	USX (Oil & Gas Segment)[3]	11,586,000	13	10,074,000	8	[4]447,000	—	NA	12	964,000
14	14	Unocal Corp.	10,062,000	15	9,393,000	17	181,000	13	1,766,000	13	877,000
15	16	Enron Corp.	9,528,812	18	5,915,766	379	(29,296)	15	1,613,460	25	225,942
16	15	Conoco Inc.[5]	9,146,000	11	11,097,000	10	[6]277,000	—	NA	8	1,480,000
17	17	Coastal Corp.	7,989,300	16	7,536,000	19	113,100	26	859,800	35	172,300
18	18	Columbia Gas System Inc.	5,426,776	21	2,830,410	20	111,333	17	1,573,704	20	298,774
19	20	Amerada Hess Corp.	5,304,808	19	4,784,589	13	229,860	12	2,158,544	17	454,583
20	21	Transco Energy Co.	4,296,912	20	3,250,237	390	(61,311)	35	650,122	22	284,268
21	23	Ashland Oil Inc.[9]	4,058,025	17	7,311,273	18	133,432	22	1,065,399	18	388,932
22	22	Consolidated Natural Gas Co.	3,946,905	25	2,328,907	16	186,047	16	1,598,184	19	359,699
23	27	Enserch Corp.	3,336,470	22	2,820,167	40	30,485	25	958,156	26	215,381
24	25	Pennzoil Co.	3,304,707	26	1,836,302	31	44,256	36	621,274	30	198,668
25	31	Freeport-McMoRan Inc.	3,155,102	28	1,540,885	11	248,751	23	1,022,235	14	808,926
26	26	Sonat Inc.	3,115,015	30	1,498,684	21	105,032	24	1,002,665	32	189,996
27	28	Kerr-McGee Corp.	3,071,000	23	2,639,000	24	81,000	19	1,363,000	24	235,000
28	29	Mesa L.P.	2,680,960	56	352,930	39	31,907	20	[10]1,295,009	65	57,810
29	32	Arkla Inc.	2,524,402	37	1,191,837	25	78,283	30	750,811	34	176,015
30	30	Meridian Oil Inc.[12]	2,268,495	42	735,912	43	27,370	18	1,431,474	47	102,620
31	33	Mitchell Energy & Development Corp.[13]	2,112,139	49	561,882	73	8,755	39	561,895	45	104,529
32	35	Murphy Oil Corp.	2,066,590	29	1,517,638	384	(43,638)	31	750,066	38	162,932
33	34	Nicor Inc.	1,999,961	31	1,439,002	22	83,735	40	550,151	41	144,251
34	24	Maxus Energy Corp.[14]	1,900,500	43	691,000	399	(539,600)	61	197,000	31	197,500
35	37	Union Pacific Resources Co.[15]	1,883,000	33	1,421,000	15	206,000	33	704,000	29	208,000
36	38	Montana Power Co.	1,862,896	46	629,350	27	62,427	28	800,412	55	79,058
37	39	American Petrofina Inc.	1,835,889	24	2,510,411	23	83,284	32	731,281	27	215,103
38	36	Union Texas Petroleum Holdings Inc.	1,632,773	36	1,257,903	28	55,942	78	132,646	33	188,821
39	42	Louisiana Land & Exploration Co.	1,607,100	40	828,400	48	24,800	38	586,700	28	211,100
40	43	Union Exploration Partners Ltd.[17]	1,554,600	44	684,300	14	207,000	21	[10]1,226,700	36	165,800
41	46	Primark Corp.	1,491,060	34	1,370,673	327	(1,727)	45	426,959	52	81,751
42	45	Cabot Corp.[9]	1,463,132	32	1,436,485	42	28,694	37	590,741	51	94,813
43	48	Anadarko Petroleum Corp.	1,430,486	62	230,746	71	9,084	44	427,123	44	119,634
44	47	Global Marine Inc.	1,386,900	94	94,300	395	(131,500)	381	(49,700)	137	8,600
45	44	BHP Petroleum (Americas) Inc.[18,19]	1,358,004	65	209,402	38	33,332	74	146,322	82	37,475
46	53	Enserch Exploration Partners Ltd.[20]	1,180,733	63	225,082	29	51,779	27	[10]847,655	39	147,551
47	50	National Fuel Gas Co.[9]	1,119,374	41	743,067	32	42,492	47	393,490	43	127,303
48	49	Transco Exploration Partners Ltd.[21]	1,107,308	61	272,948	371	(13,579)	34	[10]673,443	48	101,898
49	62	Freeport-McMoRan Energy Partners Ltd.[22]	1,105,427	78	147,919	67	13,508	29	[10]790,948	61	69,807
50	60	Santa Fe Energy Co.[23]	[24]1,057,500	57	331,200	30	[25]46,500	—	NA	21	[24]293,100
51	52	Questar Corp.	1,046,747	50	497,359	46	25,930	42	472,217	50	97,861

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
1	637.0	1	1,436.0	1	6,634.0	1	22,365.0	2	276.0	2	735.0	4	2,634.0	2	9,761.0	7	374.0
7	227.0	2	1,429.0	8	2,397.0	2	20,287.0	8	112.0	6	610.0	8	1,024.0	3	7,741.0	3	646.0
3	329.0	5	816.0	2	3,348.0	4	9,444.0	6	185.0	3	708.0	5	1,809.0	4	7,078.0	9	283.0
2	355.0	4	885.0	3	3,089.0	5	7,847.0	5	197.0	1	748.0	7	1,603.0	7	4,783.0	2	699.0
8	214.0	6	665.0	6	2,915.0	6	6,914.0	4	204.0	4	656.0	3	2,782.0	5	6,541.0	1	1,266.0
5	291.0	3	1,022.0	7	2,580.0	3	15,400.0	7	142.0	5	617.0	6	1,670.0	1	10,690.0	4	629.0
4	310.0	20	123.0	5	3,026.0	11	3,890.0	1	309.0	20	105.0	1	2,953.0	17	1,932.0	17	122.0
6	266.0	7	523.0	4	3,041.0	7	6,751.0	3	243.0	7	464.0	2	2,818.0	6	5,854.0	10	272.0
15	55.00	10	372.0	16	407.0	13	2,948.0	13	39.00	8	372.0	14	270.0	11	2,943.0	23	82.90
10	110.0	13	298.0	14	736.0	14	2,932.0	15	26.00	10	282.0	16	222.0	13	2,734.0	13	189.9
14	77.00	14	274.0	13	763.0	16	2,696.0	10	59.00	13	230.0	10	621.0	15	2,232.0	5	453.0
12	91.00	9	407.0	10	909.0	9	5,285.0	12	51.00	11	281.0	12	457.0	9	3,369.0	14	159.0
13	79.68	11	358.8	12	798.0	10	4,746.4	11	57.99	12	274.5	11	620.8	10	3,277.6	6	428.0
11	97.00	8	428.0	11	897.0	8	6,093.0	9	63.00	9	283.0	9	656.0	8	4,399.0	11	266.0
39	4.533	18	129.2	36	42.31	23	1,424.1	37	3.729	17	124.1	30	36.34	20	1,359.9	35	48.30
9	132.0	12	305.0	9	1,031.0	12	3,200.0	14	39.00	14	219.0	13	351.0	10	1,959.0	16	127.7
42	4.011	35	[7]67.63	47	25.96	26	[7]1,068.0	36	4.011	33	[7]67.63	39	25.96	24	[7]1,068.0	55	[8]24.30
59	2.199	33	75.87	61	14.13	32	882.1	60	1.597	31	73.85	76	7.732	29	732.7	—	NA
16	50.00	15	194.0	15	471.0	18	2,018.0	16	25.00	22	103.0	17	201.0	27	771.0	49	30.00
40	4.394	36	67.01	54	18.07	46	399.1	34	4.394	34	67.01	46	18.07	42	399.1	61	22.00
25	13.70	76	14.50	32	54.60	72	198.4	85	0.900	68	14.50	134	2.800	63	198.4	37	43.00
38	4.725	23	109.6	42	30.85	24	1,208.0	35	4.339	19	109.4	36	26.98	22	1,207.0	8	289.9
49	3.099	34	73.47	45	27.16	27	1,054.9	47	2.706	32	73.47	43	23.62	25	1,054.1	20	94.90
27	11.00	24	108.0	20	137.0	30	903.0	22	11.00	23	103.0	19	135.0	26	821.0	26	72.30
30	8.200	31	79.10	29	76.60	28	978.7	24	8.000	30	74.90	25	71.10	31	701.9	38	42.95
56	2.618	49	39.80	85	7.419	70	205.7	49	2.618	46	39.80	79	7.419	61	205.7	66	19.35
26	13.30	29	87.30	25	89.60	35	712.9	25	6.700	29	77.40	32	33.90	36	563.8	50	29.43
31	6.600	26	104.6	26	89.52	19	1,920.6	26	6.600	21	104.6	21	[11]89.52	18	[11]1,920.6	29	67.00
142	0.276	40	55.00	121	4.497	36	704.1	140	0.276	37	55.00	112	4.497	30	704.1	31	55.30
28	9.672	16	150.9	28	84.40	15	2,807.0	23	9.672	15	150.9	23	84.40	12	2,807.0	21	90.50
24	14.10	43	48.00	27	86.70	41	549.5	20	14.10	40	48.00	22	86.70	37	549.5	33	50.22
22	17.90	37	66.50	23	107.0	37	632.7	28	5.800	38	54.80	34	29.80	45	321.1	45	34.50
81	1.100	69	16.60	102	6.200	94	104.9	74	1.100	64	16.60	92	6.200	82	104.9	97	8.500
18	23.24	22	111.6	21	134.2	33	881.9	33	4.587	24	99.73	29	38.45	28	744.2	25	73.90
19	22.30	19	124.9	18	144.6	22	1,474.1	17	21.20	18	120.0	20	130.0	21	1,355.0	27	70.00
110	[16]0.583	70	[16]16.08	119	[16]4.634	48	[16]349.9	129	[16]0.344	93	[16]7.749	158	[16]1.901	72	[16]134.8	64	[16]20.74
34	5.794	59	28.47	41	31.21	56	291.7	29	5.794	56	28.47	33	31.21	48	291.7	43	35.20
17	26.22	21	119.4	22	109.6	21	1,581.7	38	3.634	43	43.86	42	23.71	44	331.7	36	45.83
23	15.80	25	107.7	24	94.10	34	819.3	21	11.30	27	88.00	26	56.10	34	590.2	46	31.00
20	20.00	17	143.0	17	227.0	17	2,524.0	18	20.00	16	143.0	15	227.0	14	2,524.0	34	50.00
193	0.125	127	3.866	382	0.017	162	24.72	191	0.125	124	3.866	380	0.017	157	24.72	—	—
72	1.351	53	35.37	78	8.057	44	494.6	66	1.351	50	35.37	72	8.057	40	494.6	24	78.40
43	3.914	27	95.91	53	19.45	20	1,772.0	40	3.466	25	94.36	50	15.37	19	1,717.1	30	66.80
137	0.322	191	1.300	166	1.789	132	43.50	133	0.322	188	1.300	162	1.789	127	43.50	148	2.660
35	5.101	52	35.51	30	71.22	39	600.7	31	5.101	49	35.51	24	71.22	33	600.7	52	25.00
54	2.668	30	84.06	51	22.70	25	1,200.5	48	2.668	28	84.06	44	22.70	23	1,200.5	19	108.3
154	0.213	79	13.11	71	10.80	82	134.8	151	0.213	71	13.11	64	10.80	71	134.8	22	85.00
33	5.949	28	90.73	49	24.47	42	540.3	27	5.949	26	90.73	41	24.47	38	540.3	62	22.00
51	2.945	41	53.02	34	45.42	40	588.3	45	2.945	39	53.02	28	45.42	35	588.3	41	38.32
21	19.10	58	29.50	19	139.3	66	217.2	19	19.10	54	29.50	18	139.3	57	217.2	15	151.0
48	3.178	57	30.28	57	[16]15.76	43	[16]509.0	43	3.178	53	30.28	48	[16]15.76	39	[16]509.0	67	19.00

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Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Rank	Total revenue $000	Rank	Net income $000	Rank	Stockholders' equity $000	Rank	Capital & Expl. spending $000
52	57	Total Petroleum (North America) Ltd.	1,014,053	27	1,747,009	378	(26,823)	53	308,296	42	131,941
53	51	Ocean Drilling & Exploration Co.[26]	997,840	54	390,084	394	(129,325)	41	476,217	73	47,638
54	54	Equitable Resources Inc.	974,864	53	408,274	33	41,078	43	453,757	56	77,760
55	61	Hamilton Oil Corp.	955,370	58	320,881	55	21,905	49	349,458	75	41,988
56	56	Oneok Inc.[27]	919,167	47	587,013	57	19,362	51	323,651	72	49,200
57	55	Grace Natural Resources Group[28]	[29]917,000	55	388,200	52	[25]22,400	—	NA	96	23,000
58	64	Diversified Energies Inc.	794,310	45	657,742	44	27,232	58	258,996	60	71,720
59	59	Zapata Corp.[9]	766,157	76	151,363	396	(155,865)	372	(10,508)	88	31,935
60	—	Newmont Oil Co.[30]	755,551	88	105,903	35	[25]35,177	—	NA	100	20,541
61	63	Reading & Bates Corp.[31]	742,407	66	198,442	397	(191,094)	382	(66,525)	120	12,793
62	69	CENEX (Farmer's Union Central Exchange)[9]	639,130	38	1,138,492	128	1,236	55	281,479	159	5,627
63	66	Unimar Co.	628,732	70	176,575	383	(40,035)	63	[32]193,166	91	28,197
64	70	Quaker State Corp.	612,562	39	859,696	387	(48,057)	52	320,330	53	79,396
65	73	Tesoro Petroleum Corp.[9]	577,628	35	1,320,236	329	(1,776)	65	186,724	110	18,322
66	74	Helmerich & Payne Inc.[9]	571,348	73	153,915	54	22,016	46	420,833	67	54,170
67	72	Pogo Producing Co.	565,507	80	141,146	65	16,432	296	1,474	93	26,054
68	71	Noble Affiliates Inc.	516,793	68	189,570	64	16,447	64	192,403	70	52,607
69	65	Apache Corp.	504,333	92	102,091	391	(71,035)	79	128,780	87	32,016
70	96	Triton Energy Corp.[19]	483,761	89	105,865	375	(23,480)	68	176,942	23	242,186
71	78	Forest Oil Corp.	474,462	84	115,342	80	6,278	100	83,601	71	50,491
72	68	Apache Petroleum Co. L.P.[33]	473,468	72	155,499	393	(101,181)	66	[10]185,768	89	30,600
73	81	Adobe Resources Corp.	473,458	91	105,374	45	25,971	48	370,450	81	37,666
74	90	Pacific Enterprises Oil & Gas Co.[34]	461,356	74	153,820	37	34,815	59	231,105	40	145,164
75	76	Tidewater Inc.[35]	447,122	71	173,051	389	(56,678)	60	206,150	163	5,376
76	80	Sunshine Mining Co.	445,481	77	150,249	388	(51,771)	69	176,922	111	18,291
77	83	Kaneb Services Inc.	432,234	90	105,514	381	(35,500)	89	92,764	119	13,004
78	88	Sante Fe Energy Partners L.P.[36]	422,500	82	131,200	372	(13,900)	57	[10]262,800	46	103,800
79	94	NRM Energy Co. L.P.	409,963	104	56,282	385	(44,197)	54	[10]289,387	49	98,755
80	79	CSX Oil & Gas Corp.[37]	392,130	86	114,273	76	8,126	72	150,508	79	38,141
81	82	Southern Union Co.	381,764	67	191,580	361	(7,622)	81	111,652	112	18,180
82	84	Diamond Shamrock Offshore Partners L.P.[38]	365,767	83	119,453	370	(11,782)	50	[10]333,700	66	57,561
83	115	Ram Industries Inc.[39,35]	338,017	—	—	214	(101)	56	279,560	—	0
84	92	National Cooperative Refinery Assoc.[40]	335,528	48	572,076	41	28,829	73	[41]148,410	123	12,274
85	—	Total Minatome Corp.[42]	306,860	98	70,063369		(11,022)	76	141,625	37	163,554
86	91	First Mississippi Corp.[40]	296,362	59	295,741	59	18,610	71	158,606	105	19,527
87	97	Dekalb Energy Cos.[43,27]	294,900	101	66,800	51	[44]23,400	—	NA	76	41,000
88	95	Seagull Energy Corp.	291,845	75	152,923	75	8,180	84	108,136	115	15,221
89	93	Sabine Corp.[45]	264,658	100	68,780	360	(7,521)	70	170,864	84	36,407
90	108	Pelto Oil Co.[46]	263,700	108	44,621	72	8,999	67	181,065	80	38,023
91	98	Southwestern Energy Co.	262,817	97	74,408	69	9,810	95	87,158	108	18,764
92	85	Primary Fuels Inc.[47]	256,055	87	113,987	89	[48]4,475	—	NA	68	53,300
93	101	Quinoco Cos.	245,372	96	80,698	81	6,124	62	194,585	201	2,255
94	99	NUI Corp.[9]	241,143	60	289,182	74	8,299	114	54,711	97	22,647
95	100	TGX Corp.	237,065	93	98,594	84	5,744	87	100,273	174	4,618
96	—	Damson Energy Co. L.P.[49]	236,851	95	85,522	392	(93,599)	83	108,510	185	3,390
97	111	Hadson Corp.	228,645	51	433,525	83	5,851	96	85,057	102	20,345
98	104	Allegheny & Western Energy Corp.[40]	205,407	64	223,286	63	17,413	99	84,150	104	19,708
99	103	NOMECO (Northern Michigan Expl. Co.)[50]	204,163	99	69,250	50	23,516	75	143,265	83	37,378
100	107	Norcen Energy Resources Ltd.[51]	203,000	149	18,000	308	(1,000)	—	NA	107	19,000
101	137	Conquest Exploration Co.	199,424	136	22,583	363	(8,381)	80	123,720	127	11,175
102	106	Prairie Producing Co.[52]	184,040	118	32,822	380	(33,484)	383	(114,232)	98	20,812

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
36	4.960	66	17.98	37	39.90	52	339.4	50	2.390	80	10.57	68	9.970	101	74.67	99	7.900
29	8.357	45	45.76	38	39.16	57	289.8	41	3.320	42	43.92	55	12.86	56	231.7	74	15.99
82	1.085	48	39.86	77	8.381	38	603.5	75	1.085	45	39.86	70	8.381	32	603.5	18	109.0
57	2.486	42	49.96	31	69.73	31	891.0	131	0.334	109	5.712	130	2.979	143	31.86	234	0.250
107	0.618	77	14.08	133	3.240	92	108.7	100	0.618	69	14.08	125	3.240	80	108.7	71	16.63
76	1.227	60	24.91	87	7.374	73	189.8	70	1.204	57	24.22	81	7.241	64	178.6	86	11.20
115	0.501	63	19.70	139	2.913	84	129.2	110	0.501	60	19.70	132	[11]2.913	73	[11]129.2	91	9.550
161	0.200	84	11.70	157	2.100	83	131.0	206	0.100	82	10.40	191	1.100	83	101.5	—	—
69	1.460	54	32.11	83	7.561	62	250.7	62	1.408	66	15.12	96	5.783	105	62.55	153	2.310
91	0.905	98	8.043	90	6.834	96	98.00	95	0.718	92	8.043	84	6.834	86	98.00	124	4.540
64	1.914	196	1.220	69	11.79	230	7.132	57	1.914	193	1.220	61	11.79	227	7.132	88	10.00
61	2.096	32	79.07	56	16.24	29	967.0	73	1.110	83	9.711	107	4.878	104	64.27	107	6.700
88	0.946	121	4.595	82	7.685	111	60.37	82	0.946	116	4.595	77	7.685	106	60.37	28	67.80
68	1.497	135	3.539	129	3.746	118	52.57	106	0.553	132	3.534	136	2.757	163	23.33	150	2.530
90	0.941	85	11.59	86	7.406	60	271.2	84	0.941	77	11.59	80	7.406	51	271.2	114	5.200
50	3.095	56	30.32	52	20.81	51	344.1	44	3.095	52	30.32	45	20.27	53	254.4	85	11.90
45	3.861	39	58.66	43	30.08	53	331.4	39	3.533	36	57.72	37	26.42	46	316.6	54	24.39
63	2.008	46	40.89	70	11.30	61	270.0	56	2.008	44	40.89	63	11.30	52	270.0	77	14.96
41	4.374	64	19.70	35	43.48	65	219.6	98	0.664	117	4.567	123	3.313	138	35.14	120	4.940
103	0.679	47	40.78	106	5.893	49	345.9	103	0.581	47	39.26	121	3.432	49	272.4	111	5.800
46	3.274	38	64.76	60	14.68	55	312.2	42	3.274	35	64.76	51	14.68	47	312.2	96	8.630
47	3.238	68	17.76	40	33.13	63	248.1	55	2.050	63	17.76	38	26.28	54	248.1	102	7.390
32	6.295	61	23.19	33	52.38	75	167.3	30	5.524	58	21.25	27	[11]52.38	66	[11]167.3	12	206.1
65	1.684	234	0.640	101	6.234	294	2.317	378	0.001	338	0.065	381	0.015	373	0.221	—	NA
79	1.126	74	14.90	96	6.440	79	142.6	76	1.076	72	12.53	99	5.550	89	86.91	121	4.870
95	0.852	86	11.04	125	4.002	109	74.21	89	[11]0.852	78	[11]11.04	116	[11]4.002	102	[11]74.21	72	16.30
37	4.800	55	31.60	44	29.80	67	211.9	32	4.800	51	31.60	35	29.80	58	211.9	32	51.50
85	1.026	65	18.02	67	12.13	78	146.8	79	1.026	61	18.02	59	12.13	68	146.8	—	NA
55	2.625	51	37.95	58	15.68	47	367.5	52	2.153	48	37.95	56	12.75	55	232.5	75	15.03
151	0.227	133	3.658	162	1.955	103	83.99	148	0.227	130	3.658	157	1.955	93	83.99	104	7.000
67	1.553	44	47.18	65	12.48	68	211.4	61	1.553	41	47.18	57	12.48	59	211.4	110	6.200
—	—	—	—	59	15.60	45	460.0	—	—	—	—	49	15.60	41	460.0	—	—
73	1.343	136	3.379	92	6.753	135	41.64	67	1.343	135	3.379	86	6.753	130	41.64	47	31.00
62	2.080	67	17.81	64	12.88	76	157.7	54	2.080	62	17.81	54	12.88	67	157.7	78	14.77
127	0.389	97	8.061	170	1.620	140	37.91	119	0.389	91	8.061	166	1.620	135	37.91	100	7.700
52	2.800	73	15.00	46	26.70	54	322.5	58	1.800	102	6.300	62	11.60	118	49.80	53	25.00
317	0.020	107	6.351	357	0.058	150	29.19	313	0.020	101	6.351	352	0.058	145	29.19	142	3.090
60	2.100	81	12.30	66	12.40	90	113.7	53	2.100	74	12.30	58	12.40	84	101.5	51	27.78
97	0.843	72	15.51	88	7.195	80	137.6	91	0.843	65	15.51	82	7.195	69	137.6	73	16.10
155	0.211	90	9.420	210	0.888	69	210.5	152	0.211	84	9.420	206	0.888	60	210.5	60	22.20
44	3.887	50	39.17	50	23.51	58	281.7	59	1.626	55	29.12	65	10.59	77	121.7	70	17.00
58	2.280	62	20.66	68	11.83	71	201.6	51	2.280	59	20.66	60	11.83	62	201.6	184	1.000
225	0.085	220	0.856	288	0.281	246	4.958	223	0.085	215	0.856	284	0.281	244	4.958	183	1.100
167	0.186	125	4.200	147	2.478	74	169.0	164	0.186	121	4.200	144	2.478	65	169.0	174	1.320
70	1.419	89	9.674	81	7.768	86	124.7	64	1.383	86	9.080	75	7.768	74	124.7	268	0.015
130	0.380	105	6.728	172	1.599	141	37.57	124	0.380	99	6.728	168	1.599	136	37.57	94	8.900
384	0.001	177	1.600	373	0.028	154	27.81	384	0.001	174	1.600	370	0.028	149	27.81	42	36.04
66	1.600	82	12.10	93	6.700	101	85.30	63	1.394	75	12.10	101	5.502	95	81.37	80	14.48
121	0.457	120	4.598	98	6.378	100	85.81	115	0.457	115	4.598	89	6.378	91	85.81	76	15.00
120	0.465	101	6.906	103	6.094	107	76.80	114	0.465	95	6.906	93	6.094	99	76.80	106	6.900
96	0.850	95	8.719	79	7.877	120	51.40	90	0.850	90	8.719	73	7.877	115	51.40	92	9.000

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Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
103	102	Home Petroleum Corp.[53,27]	182,517	112	38,418	112	[54]1,847	—	NA	135	9,053
104	125	Snyder Oil Partners L.P.	169,235	106	48,516	85	5,400	77	[10]138,609	57	76,446
105	112	Pyro Energy Corp.	161,050	85	115,247	79	6,396	102	77,861	150	6,010
106	129	Global Natural Resources Inc.	157,334	119	32,505	333	(2,209)	91	89,570	92	27,708
107	117	Statex Petroleum Inc.[55]	147,248	117	33,201	87	[25]5,103	—	NA	99	20,668
108	113	Howell Corp.	146,689	69	183,490	117	1,746	116	54,025	168	5,138
109	75	Moore McCormack Energy Inc.[56]	146,209	122	30,663	107	2,316	128	37,036	77	38,887
110	116	Park-Ohio Industries Inc.	145,241	81	134,586	340	(3,076)	101	80,958	184	3,401
111	119	Avalon Corp.	134,710	132	24,689	183	100	85	102,597	85	34,482
112	122	Wainoco Oil Corp.	126,777	115	33,933	49	24,523	107	65,929	116	14,223
113	121	Harken Oil & Gas Inc.	125,111	52	420,905	95	3,209	105	68,345	128	11,001
114	118	Kaneb Energy Partners Ltd.[57]	121,422	105	52,524	68	11,707	104	[10]69,430	147	6,866
115	109	Damson Oil Corp.[9]	120,554	126	29,037	374	(21,496)	251	3,444	212	1,834
116	164	Presidio Oil Co.	119,097	188	[58]9,054	320	[58](1,466)	133	31,095	161	[58]5,573
117	—	Parker & Parsley Development Partners L.P.	117,266	116	33,296	362	(8,092)	82	[10]110,837	106	19,124
118	126	Sage Energy Co.[40]	115,746	129	27,378	343	(3,232)	109	62,994	126	11,636
119	130	Ensource Inc.	111,583	121	30,701	241	(221)	119	48,288	121	12,636
120	131	Wiser Oil Co.	105,628	120	31,805	97	2,952	90	90,498	114	16,020
121	—	NGC Energy Co.[59]	104,998	156	15,484	350	(4,579)	127	38,403	64	65,204
122	128	Noble Drilling Corp.	103,654	128	28,018	366	(10,148)	94	87,329	140	8,047
123	191	Nerco Oil & Gas Inc.[60]	103,200	159	14,100	358	(6,700)	93	88,000	62	69,300
124	133	San Juan Basin Royalty Trust	102,013	146	18,356	61	17,852	86	[61]101,205	—	0
125	—	Prudential-Bache Energy Income L.P. IVP-17	96,998	169	12,201	100	2,691	92	[10]88,104	59	71,858
126	—	Prudential-Bache Energy Income L.P. VP-19	96,463	229	4,614	149	559	88	[10]93,259	54	79,335
127	141	American Exploration Co.[63]	96,094	125	29,687	122	1,491	169	16,253	141	7,830
128	142	Flag Redfern Oil Co.	93,570	123	30,442	93	3,495	106	67,983	109	18,573
129	—	Prudential-Bache Energy Income L.P. IVP-16	93,247	166	13,280	98	2,833	97	[10]84,556	58	71,886
130	139	Integrated Drilling & Exploration Inc.[64]	90,420	139	20,806	220	(127)	98	84,205	153	5,834
131	136	Crystal Oil Co.	89,232	110	40,336	99	2,762	154	21,258	196	2,587
132	138	Consolidated Oil & Gas Inc.[65]	85,953	148	18,026	365	(9,399)	379	(22,620)	228	1,385
133	144	Chieftain Development Co. Ltd.[51,66]	84,218	165	13,365	291	(671)	—	NA	139	8,209
134	120	Kirby Exploration Co. Inc.[67]	82,004	107	47,642	82	6,031	118	49,706	157	5,657
135	165	Plains Resources Inc.	78,856	164	13,514	316	(1,292)	147	24,253	90	[68]29,241
136	145	Tom Brown Inc.[35]	75,253	143	18,959	339	(2,980)	139	28,018	190	3,072
137	—	Prudential-Bache Energy Income L.P. VP-18	74,907	218	5,262	140	860	103	[10]72,098	63	65,588
138	—	Damson Income Energy L.P.[69]	73,716	141	20,405	376	(23,862)	112	[10]58,992	199	2,502
139	—	Berry Petroleum Co.	72,741	103	57,628	58	19,355	113	55,474	160	5,578
140	148	Exploration Co. of Louisiana Inc.	72,435	124	30,190	78	7,570	111	59,001	143	7,490
141	159	Beard Co.[70]	70,219	152	16,462	86	5,336	136	29,401	124	12,170
142	169	Patrick Petroleum Co.	69,162	189	9,009	148	562	130	34,173	117	14,063
143	123	Texas American Energy Corp.	67,022	177	10,364	66	15,704	159	18,252	191	2,987
144	135	MCO Resources Inc.	66,062	133	23,389	377	(25,813)	378	(21,730)	263	724
145	—	Damson Institutional Energy L.P.[71]	65,772	138	20,861	373	(20,084)	122	[10]44,062	259	749
146	—	Hutton/Energy Assets 3rd Energy Ptrsp. A Ltd.	64,519	194	7,913	105	2,390	108	[10]63,581	103	20,138
147	—	Apache Offshore Investment Partnership[72]	63,716	235	4,106	368	(10,785)	232	[10]4,624	136	8,680
148	147	Freeport-McMoRan Oil and Gas Royalty Trust	62,857	145	18,386	62	[73]17,635	110	[61]59,221	—	NA
149	150	Pauley Petroleum Inc.[67]	60,222	79	142,042	231	(167)	140	27,688	176	4,221
150	—	Prudential-Bache Energy Income L.P. IIIP-14	59,331	191	8,653	127	1,301	115	[10]54,657	69	53,100
151	153	Equity Oil Co.	56,342	162	13,868	109	2,157	124	40,513	189	3,250
152	140	Unit Corp.	56,066	127	28,888	382	(35,635)	126	40,115	169	5,085
153	151	Houston Oil Trust	53,507	250	3,276	121	[73]1,550	117	[61]53,505	—	NA

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
87	0.969	91	9.403	84	7.559	88	122.8	81	0.969	85	9.403	78	7.559	76	122.8	105	7.000
84	1.030	87	10.85	62	13.84	87	124.4	78	1.030	79	10.85	52	13.84	75	124.4	59	22.73
146	0.255	161	2.312	164	1.828	183	17.02	144	0.255	159	2.312	160	1.828	180	17.02	259	0.080
124	0.406	99	7.600	97	6.406	77	153.0	121	[11]0.383	114	[11]5.125	98	[11]5.564	90	[11]86.13	81	14.40
152	0.226	110	6.013	155	2.169	99	87.99	149	0.226	105	6.013	151	2.169	88	87.99	63	21.90
98	0.823	116	5.534	104	5.954	97	89.99	92	0.817	113	5.318	95	5.818	97	80.42	131	4.120
108	0.614	113	5.883	74	10.22	106	79.77	101	0.614	108	5.883	67	10.22	98	79.77	117	5.000
204	0.110	150	2.687	181	1.458	126	45.13	202	0.110	149	2.687	177	1.458	121	45.13	185	1.000
116	0.498	118	5.515	117	4.670	85	128.7	138	0.293	269	0.288	143	2.497	287	2.553	204	0.500
105	0.656	71	15.88	112	5.172	64	247.6	127	0.365	133	3.497	128	3.009	113	53.34	109	6.290
184	0.143	225	0.763	180	1.461	206	12.11	182	0.143	221	0.763	176	1.461	203	12.11	135	3.570
86	1.001	78	13.38	116	4.774	98	89.90	80	1.001	70	13.38	109	4.774	87	89.90	83	13.90
114	0.528	129	3.767	142	2.724	123	49.65	109	[11]0.528	126	[11]3.767	137	[11]2.724	119	[11]49.65	271	0.004
168	[58]0.181	153	[58]2.628	143	2.713	91	109.2	165	[58]0.181	152	[58]2.628	138	2.713	78	109.2	79	[58]14.77
99	0.793	83	11.81	91	6.769	108	75.52	93	0.793	76	11.81	85	6.769	100	75.52	93	9.000
80	1.114	123	4.449	72	10.50	139	37.96	72	1.114	119	4.449	66	10.50	134	37.96	90	9.600
118	0.481	94	8.767	130	3.599	95	99.17	112	0.481	89	8.767	120	3.599	85	99.17	115	5.150
94	0.876	108	6.216	76	9.235	102	84.36	88	0.876	103	6.216	69	[11]9.235	92	[11]84.36	39	41.00
153	0.215	93	9.020	171	1.604	93	108.5	150	0.215	88	9.020	167	1.604	81	108.5	125	4.500
252	0.056	261	0.374	260	0.386	271	3.268	249	0.056	259	0.374	256	0.386	269	3.268	126	4.500
135	0.337	122	4.538	141	2.794	114	58.88	130	0.337	118	4.538	135	2.794	109	58.88	—	NA
248	0.061	80	12.46	195	1.077	59	272.0	245	0.061	73	12.46	193	1.077	50	272.0	197	[62]0.600
139	0.307	147	2.900	109	5.440	124	47.37	136	0.307	146	2.900	102	5.440	120	47.37	—	—
175	0.164	238	0.583	108	5.533	156	27.34	171	0.164	233	0.583	100	5.533	151	27.34	—	—
100	0.739	104	6.743	118	4.658	116	57.16	94	0.739	98	6.743	110	4.658	111	57.16	138	3.420
89	0.946	112	5.964	89	6.976	138	39.05	83	0.946	107	5.964	83	6.976	133	39.05	68	18.70
140	0.306	152	2.670	105	5.898	128	44.42	137	0.306	151	2.670	94	5.898	123	44.42	—	—
188	0.133	145	3.043	193	1.109	130	43.84	185	0.133	143	3.043	190	1.109	125	43.84	89	10.00
71	1.382	88	10.46	107	5.639	127	45.03	65	1.382	81	10.46	97	5.639	122	45.03	163	1.800
122	0.453	114	5.769	111	5.249	89	121.0	117	0.439	112	5.353	104	5.147	79	109.1	166	1.700
111	0.559	260	0.376	110	5.268	195	14.06	104	0.559	258	0.376	103	5.268	191	14.06	216	0.390
—	NA	—	NA	140	2.811	175	20.51	—	NA	—	NA	133	2.811	172	20.51	—	NA
145	0.258	134	3.601	184	1.395	112	60.23	143	0.258	131	3.601	181	1.395	107	60.23	122	4.780
101	0.702	138	3.236	114	5.066	117	53.91	96	0.702	137	3.236	106	5.066	112	53.91	198	0.600
180	0.150	199	1.193	122	4.264	167	22.66	177	0.150	195	1.193	113	4.264	164	22.66	—	—
126	[74]0.390	143	3.068	148	2.440	137	39.76	123	0.382	145	2.933	145	2.440	132	39.76	—	—
53	2.709	233	0.645	39	34.38	211	10.73	46	2.709	229	0.645	31	34.38	208	10.73	224	0.300
183	0.146	131	3.741	300	0.225	178	19.55	180	0.146	128	3.741	296	0.225	175	19.55	155	2.260
109	0.605	158	2.346	134	3.114	193	14.22	102	0.605	157	2.346	126	3.114	189	14.22	48	30.71
162	0.196	198	1.201	200	0.979	196	14.06	158	0.196	194	1.201	198	0.979	192	14.06	157	2.160
131	0.373	172	1.646	136	2.988	192	14.36	125	0.373	170	1.646	129	2.988	188	14.36	—	—
119	0.475	92	9.067	146	2.595	115	58.13	113	0.475	87	9.067	142	[11]2.595	110	[11]58.13	161	1.960
133	0.364	163	2.310	163	1.859	160	26.19	128	0.355	162	2.160	159	1.859	155	26.19	—	—
212	0.097	170	1.883	229	0.617	131	43.70	209	0.097	168	1.883	227	0.617	126	43.70	—	—
342	0.011	165	2.140	236	0.551	146	33.12	338	0.011	163	2.140	234	0.551	141	33.12	—	NA
150	0.236	100	7.428	262	0.379	170	21.92	147	0.236	94	7.428	258	0.379	167	21.92	—	NA
83	1.043	242	0.537	94	6.538	257	4.385	77	1.043	237	0.537	87	6.538	255	4.385	225	0.300
160	0.201	166	2.018	135	3.095	136	40.21	157	0.201	164	2.018	127	3.095	131	40.21	—	—
104	0.658	231	0.659	75	10.13	148	32.67	107	0.543	246	0.443	71	8.224	148	28.04	154	2.310
164	0.191	151	2.682	192	1.136	169	22.40	161	0.191	150	2.682	189	1.136	166	22.40	84	11.91
125	[74]0.391	128	[74]3.789	178	[74]1.507	159	[74]26.61	118	[74]0.391	125	[74]3.789	173	[74]1.507	154	[74]26.61	—	NA

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Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
154	187	Calumet Industries Inc.[9]	53,317	111	38,732	336	(2,266)	168	16,555	101	20,437
155	—	Prudential-Bache Energy Income L.P. IIIP-15	51,167	201	7,552	134	1,060	120	[10]47,132	74	43,478
156	179	Bogert Oil Co.[9]	49,394	147	18,183	115	1,754	158	19,390	133	9,725
157	—	Prudential-Bache Energy Income L.P. IIIP-12	48,971	176	10,372	94	3,426	121	[10]44,082	94	25,722
158	170	Thermal Exploration Co.[76,9]	48,842	222	[77]5,119	266	[48](349)	—	NA	129	10,840
159	105	Texas International Co.	48,666	113	35,924	386	(44,222)	384	(143,172)	113	16,159
160	143	Graham-McCormick Oil & Gas Partnership[78]	48,650	155	15,745	353	(5,597)	351	[10](23)	295	379
161	160	Wilshire Oil Co. of Texas	47,503	186	9,198	145	619	181	12,345	183	3,435
162	—	PaineWebber/Geodyne Energy Income L.P. II-A	44,603	260	2,787	151	515	123	[10]43,048	95	25,328
163	—	Clinton Gas Systems Inc.[79]	44,469	109	42,830	177	160	157	19,436	187	3,282
164	171	Fuel Resources Inc.[80,9]	44,369	175	10,414	169	220	167	16,776	131	10,067
165	158	Alamco Inc.	42,734	179	10,184	346	(3,448)	243	3,901	—	NA
166	178	Wolverine Exploration Co.[81]	42,189	182	9,906	26	77,851	162	17,926	78	38,404
167	167	Pend Oreille Oil & Gas Co.[82]	42,105	137	21,023	120	1,607	144	25,521	155	5,708
168	155	OKC L.P.	41,567	114	35,137	77	7,909	138	[10]29,142	—	NA
169	156	Ethyl Corp. (Oil & Gas Division)	41,567	157	14,385	110	[61]1,900	—	NA	118	13,257
170	198	Kelley Oil & Gas Partners Ltd.[83]	41,490	181	10,066	141	839	125	[10]40,376	125	12,091
171	157	General Energy Development Ltd.[84]	41,412	144	18,894	180	107	137	[10]29,381	204	1,979
172	212	Oregon Natural Gas Development Corp.[85]	41,343	198	7,740	244	(240)	141	26,583	145	7,278
173	166	DI Industries Inc.[35]	40,278	212	5,656	111	1,863	179	12,504	297	365
174	168	Fuel Resources Development Co.[86]	39,857	199	7,607	144	640	153	21,689	180	3,975
175	172	Maynard Oil Co.	39,448	154	15,901	136	996	134	29,952	205	1,958
176	180	Samson Energy Co.	38,724	187	9,090	154	472	149	[10]22,971	156	5,693
177	—	Prudential-Bache Energy Income L.P. IIIP-13	38,455	214	5,587	132	1,091	129	[10]35,354	86	34,025
178	—	Callon Consolidated Partners L.P.[87]	37,719	151	16,776	135	1,029	135	[10]29,482	277	573
179	184	Oxoco Inc.	37,499	170	11,996	205	(50)	176	12,760	226	1,503
180	183	Penn Virginia Resources Corp.[88]	36,662	185	9,250	108	[89]2,215	—	NA	132	9,727
181	182	Chapman Energy Inc.[40]	36,571	213	[90]5,624	101	[90]2,667	304	1,301	360	33
182	202	McFarland Energy Inc.	35,934	167	13,103	103	2,553	142	26,113	134	9,485
183	188	Enex Resources Corp.	34,758	174	11,231	153	480	132	31,270	215	1,653
184	177	Devon Resource Investors L.P.	34,616	180	10,072	347	(3,598)	150	[10]22,545	179	4,060
185	190	Plains Petroleum Co.	33,069	131	24,789	70	9,130	146	24,458	172	5,010
186	185	Tipperary Corp.[9]	32,659	142	19,387	60	18,555	374	(11,634)	289	445
187	—	PaineWebber/Geodyne Energy Income L.P. II-B	32,240	363	418	191	34	131	[10]32,058	182	3,629
188	228	Saxon Oil Co.	31,686	168	12,535	129	1,139	160	18,251	193	2,674
189	207	Coho Resources Inc.[91]	31,595	210	5,784	92	4,014	300	1,406	151	5,981
190	206	Fidelity Oil Co.[92]	31,031	204	7,065	88	4,640	155	21,050	149	6,116
191	176	Alexander Energy Corp.[35]	30,647	233	4,244	349	(3,837)	182	12,344	225	1,504
192	175	Walker Energy Partners	29,661	184	9,365	364	(8,840)	237	[10]4,322	249	855
193	189	Deminex U.S. Oil Co.[93]	29,230	153	15,985	314	(1,173)	205	7,208	213	1,768
194	201	Saxon Oil Development Partners L.P.[94]	28,767	171	11,884	123	1,464	148	[10]23,251	197	2,510
195	194	Federated Natural Resources Corp.	28,715	197	7,747	321	(1,473)	246	3,857	192	2,922
196	205	MSR Exploration Ltd.[66]	28,529	240	3,924	242	(221)	152	21,960	214	1,734
197	197	Equitable Petroleum Corp.	28,484	234	4,241	249	(253)	210	6,826	321	159
198	—	Prudential-Bache Energy Income L.P. IIP-8	28,336	195	7,848	119	1,623	145	[10]25,517	138	8,553
199	—	Consolidated Energy Partners L.P.[95,65]	27,942	206	6,696	352	(5,341)	375	[10](19,509)	334	110
200	199	Petroleum Development Corp.	27,870	172	11,807	172	184	189	9,805	244	1,061
201	—	Nucorp Energy Inc.	27,323	158	14,198	173	184	178	12,560	209	1,883
202	186	ConVest Energy Partners Ltd.[96]	26,178	178	10,323	295	(728)	156	[10]20,479	202	2,104
203	192	LL&E Royalty Trust	25,989	134	23,224	53	[73]22,190	143	[61]25,989	—	NA
204	211	Belden & Blake Energy Co.	25,482	193	8,030	296	(747)	164	[10]17,316	148	6,745

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
249	0.059	—	—	279	[75]0.322	—	—	246	0.059	—	—	275	[75]0.322	—	—	—	—
170	0.174	171	1.739	144	2.635	144	34.53	166	0.174	169	1.739	139	2.635	139	34.53	—	—
141	0.278	117	5.519	145	2.598	121	51.27	139	0.278	111	5.519	141	2.598	116	51.27	58	22.90
210	0.099	149	2.804	174	1.576	113	59.24	208	0.099	148	2.804	170	1.576	108	59.24	—	—
182	0.147	190	1.317	202	0.958	180	18.51	179	0.147	187	1.317	200	0.958	177	18.51	—	NA
78	1.174	185	1.379	73	10.48	286	2.578	181	0.145	238	0.535	211	0.839	284	2.578	103	7.230
173	0.165	103	6.793	213	0.860	122	50.80	169	0.165	97	6.793	209	0.860	117	50.80	—	NA
148	0.249	160	2.313	153	2.297	151	29.15	160	0.192	176	1.540	179	1.430	196	13.71	—	NA
279	0.037	215	0.948	165	1.790	185	16.82	274	0.037	210	0.948	161	1.790	182	16.82	—	NA
221	0.087	169	1.920	272	0.331	197	14.03	219	0.087	167	1.920	268	0.331	193	14.03	—	NA
230	0.081	157	2.385	257	0.427	176	20.19	228	0.081	156	2.385	253	0.427	173	20.19	—	NA
274	0.039	155	2.503	271	0.336	164	23.99	270	0.039	154	2.503	267	0.336	160	23.99	239	0.200
149	0.240	154	2.508	355	0.063	—	—	146	0.240	153	2.508	350	[11]0.063	—	—	65	19.40
132	0.369	102	6.903	188	1.310	166	23.71	126	0.369	96	6.903	185	1.310	162	23.71	116	5.100
77	1.192	124	4.262	120	4.516	119	52.05	71	1.192	120	4.262	111	4.516	114	52.05	229	0.280
134	0.357	119	5.306	137	2.985	125	47.25	135	0.309	123	4.084	140	2.624	159	24.15	147	2.700
241	0.069	115	5.691	240	0.533	105	80.42	239	0.069	110	5.691	238	0.533	96	80.42	172	1.370
123	0.440	111	6.003	151	2.308	149	30.99	116	0.440	106	6.003	148	2.308	144	30.99	190	0.900
—	NA	291	0.197	—	NA	337	0.902	—	NA	290	0.197	—	NA	335	0.902	—	—
327	0.016	247	0.476	318	0.168	247	4.928	323	0.016	244	0.476	314	0.168	245	4.928	261	0.070
199	0.121	156	2.443	225	0.649	110	71.64	197	0.121	155	2.443	223	0.649	103	71.64	132	4.000
144	0.264	164	2.280	175	1.567	172	21.29	142	0.264	161	2.280	171	1.567	169	21.29	232	0.266
254	0.054	130	3.754	256	0.438	155	27.38	251	0.054	127	3.754	252	0.438	150	27.38	127	4.420
190	0.129	193	1.285	161	1.964	161	25.77	187	0.129	190	1.285	156	1.964	156	25.77	—	—
106	0.635	148	2.841	123	4.159	199	13.87	99	0.635	147	2.841	114	4.159	195	13.87	214	0.400
178	0.156	140	3.167	198	1.011	181	18.39	175	0.156	139	3.167	196	1.011	178	18.39	213	0.410
318	0.019	167	2.000	283	0.300	129	44.00	314	0.019	165	2.000	279	0.300	124	44.00	—	NA
238	[90]0.075	211	[90]1.033	224	0.652	210	10.78	236	[90]0.075	206	[90]1.033	222	0.652	207	10.78	255	[90]0.100
102	0.700	195	1.268	80	7.828	234	6.182	97	0.700	192	1.268	74	7.828	232	6.182	98	8.300
147	0.255	162	2.312	183	1.418	186	16.82	145	0.255	160	2.312	180	1.418	183	16.82	265	0.028
231	0.081	132	3.702	246	0.509	147	32.78	229	0.081	129	3.702	243	0.509	142	32.78	146	2.775
239	0.072	75	14.62	282	0.317	50	345.5	237	0.072	67	14.62	278	0.317	43	345.5	56	23.00
129	0.383	183	1.445	127	3.804	158	27.13	122	0.383	181	1.445	118	3.804	153	27.13	230	0.270
355	0.008	—	—	215	0.806	—	—	352	0.008	—	—	212	0.806	—	—	—	NA
112	0.555	173	1.641	113	5.096	189	16.22	105	0.555	171	1.641	105	5.096	186	16.22	264	0.040
136	0.327	359	0.040	48	24.81	288	2.554	132	0.327	358	0.040	40	24.81	286	2.554	87	11.13
75	1.304	240	0.570	63	13.00	340	0.800	69	1.289	236	0.542	53	12.90	341	0.700	40	41.00
223	0.086	178	1.551	185	1.364	171	21.79	221	0.086	175	1.551	182	1.364	168	21.79	130	4.195
181	0.148	137	3.303	189	1.215	163	24.43	178	0.148	136	3.303	186	1.215	158	24.43	256	0.100
—	NA	144	3.050	99	6.242	174	20.54	—	NA	142	3.050	90	6.242	171	20.54	129	4.200
113	0.529	176	1.603	115	4.853	190	15.72	108	0.529	173	1.603	108	4.853	187	15.72	245	0.180
174	0.165	192	1.296	247	0.484	209	11.55	170	0.165	189	1.296	244	0.484	206	11.55	209	0.480
176	0.160	315	0.107	132	3.254	255	4.473	172	0.160	314	0.107	124	[11]3.254	253	[11]4.473	—	NA
202	0.111	226	0.760	126	3.869	153	28.40	200	0.111	222	0.760	117	3.869	147	28.40	—	NA
185	0.143	159	2.322	220	0.741	157	27.33	183	0.143	158	2.322	218	0.741	152	27.33	—	NA
201	0.115	141	3.146	176	1.539	104	83.95	199	0.115	140	3.146	172	1.539	94	83.95	243	0.188
319	0.019	229	0.705	307	0.203	168	22.52	315	0.019	225	0.705	303	0.203	165	22.52	133	3.730
117	0.491	168	1.950	124	4.098	194	14.21	111	0.491	166	1.950	115	4.098	190	14.21	180	1.170
138	0.311	175	1.612	149	2.429	203	12.67	134	0.311	172	1.612	146	2.429	200	12.67	211	0.430
92	[97]0.897	142	[97]3.069	128	[97]3.763	198	[97]13.95	86	[97]0.897	141	[97]3.069	119	[97]3.763	194	[97]13.95	226	0.300
143	0.276	180	1.505	138	2.927	184	16.94	141	0.276	178	1.505	131	2.927	181	16.94	167	1.700

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Rank by total assets 1987	1986	Company	Total assets $000	Rank	Total revenue $000	Rank	Net income $000	Rank	Stockholders' equity $000	Rank	Capital & Expl. spending $000
205	—	ICG Petroleum Inc.[98]	25,399	251	3,158	150	543	161	18,214	355	43
206	—	Prudential-Bache Energy Income L.P. IIP-10	25,044	215	5,428	114	1,811	151	[10]22,418	122	12,331
207	163	Amax Oil & Gas Inc.	24,364	140	20,557	34	40,797	183	12,013	173	4,923
208	208	Mustang Resources Corp.[99,13]	23,913	205	6,836	306	(986)	195	9,083	210	1,879
209	222	Swift Energy Co.	23,746	173	11,698	91	4,024	184	10,871	220	1,573
210	218	Taurus Exploration Inc.[100,9]	23,205	183	9,536	118	1,725	190	9,650	146	7,088
211	203	KenCope Energy Cos.[40]	22,783	163	13,616	357	(6,502)	177	12,563	261	733
212	225	Barrett Resources Corp.[9]	21,281	238	4,087	290	(656)	171	15,213	171	5,041
213	195	Petroleum Investments Ltd.	21,038	200	7,579	359	(7,150)	193	[10]9,545	282	513
214	209	Baruch-Foster Corp.	20,886	190	8,781	294	(713)	180	12,391	186	3,389
215	—	American National Petroleum Co.	20,276	207	6,406	267	(354)	185	10,686	236	1,131
216	—	Prudential-Bache Energy Income L.P. IIP-11	19,993	237	4,089	125	1,334	163	[10]17,922	130	10,155
217	216	Hershey Oil Corp.	19,408	216	5,402	187	71	174	13,824	195	2,613
218	210	Tucker Drilling Co. Inc.[35]	18,675	192	8,545	318	(1,386)	165	17,233	211	1,875
219	—	Bridge Oil (USA) Inc.[101]	17,761	262	2,700	137	967	200	7,851	227	1,502
220	244	Geodyne Resources Inc.[102]	17,621	160	14,017	90	4,463	207	7,113	262	729
221	—	Columbian Energy Co. L.P.	17,580	268	2,382	334	(2,223)	166	[10]17,024	290	439
222	—	Prudential-Bache Energy Income L.P. IIP-9	17,496	227	4,759	138	965	170	[10]15,790	166	5,177
223	215	Resource Exploration Inc.[9]	16,994	217	5,330	147	589	172	15,160	260	749
224	272	Petromark Resources Co.	15,804	221	5,191	345	(3,297)	356	(624)	293	405
225	—	Garnet Resources Corp.	14,703	309	1,052	228	(155)	175	12,998	206	1,956
226	221	Sabine Royalty Trust	14,593	135	23,058	56	21,589	173	[61]14,161	—	NA
227	—	Daleco Resources Corp.[66]	14,018	336	693	332	(2,119)	337	479	344	75
228	253	Belcor Inc.[103]	13,777	161	13,879	143	713	239	4,128	194	2,658
229	154	Callon Petroleum Co.	13,627	211	5,749	331	(2,113)	194	9,203	270	602
230	223	Adams Resources & Energy Inc.	13,602	102	66,367	106	2,317	365	(4,284)	235	1,153
231	200	Quadra Oil & Gas Inc.[104]	13,446	273	2,228	218	(120)	380	(23,527)	158	5,650
232	—	Red Eagle Resources Corp.[9]	13,231	150	17,568	142	777	260	2,897	162	5,570
233	243	Energy Assets International Corp.[35]	13,204	208	6,262	286	(588)	242	3,936	170	5,041
234	251	Texon Energy Corp.[105]	12,336	281	1,705	356	(6,155)	369	(8,642)	327	136
235	—	Prudential-Bache Energy Income L.P. IIP-7	12,234	230	4,466	131	1,131	186	[10]10,235	280	526
236	230	Michigan Oil Co.[106,40]	12,226	224	4,873	348	[44](3,610)	—	NA	142	7,724
237	—	Prudential-Bache Energy Income L.P. IIP-4	12,150	239	4,006	146	604	188	[10]9,963	—	NA
238	226	Kimbark Oil & Gas Co.	11,899	223	5,055	300	(852)	264	2,517	322	57
239	231	Premier Resources Ltd.[9]	11,788	258	2,856	206	(54)	361	(1,926)	302	299
240	235	Home-Stake Royalty Corp.	11,668	220	5,216	116	1,752	187	10,174	221	1,571
241	—	Prudential-Bache Energy Income L.P. IIP-5	11,315	255	2,998	160	315	191	[10]9,592	352	50
242	239	Energy Management Corp.[27]	11,292	247	[107]3,383	193	[107]29	226	5,071	312	214
243	238	Vermilion Bay Land Co.	11,043	248	3,306	171	187	192	9,561	223	1,537
244	—	Prudential-Bache Energy Income L.P. IIP-6	10,751	228	4,652	133	1,088	197	[10]8,810	375	7
245	245	Dorchester Hugoton Ltd.	10,733	243	3,790	124	1,442	196	[10]9,063	301	314
246	236	Evergreen Resources Inc.[35]	10,710	322	820	328	(1,734)	219	5,616	217	1,628
247	232	Petrominerals Corp.	10,624	202	7,550	293	(704)	206	7,193	246	1,028
248	213	Brock Exploration Corp.[35]	10,427	209	5,975	174	182	266	2,480	203	2,018
249	241	Sage Drilling Co. Inc.[40]	10,419	232	4,331	301	(856)	216	6,004	278	539
250	217	Nugget Oil Corp.[105]	10,281	256	2,982	323	(1,522)	360	(1,557)	268	670
251	237	Seahawk Oil International Inc.	10,198	254	3,017	289	(617)	224	5,086	224	1,534
252	334	Wichita River Oil Co.[108]	10,083	257	2,885	139	917	230	4,788	164	5,282
253	249	Thor Energy Resources Inc.[13]	10,001	196	7,830	196	2	215	6,288	251	847
254	283	Falcon Oil & Gas Co. Inc.[13]	9,901	289	1,520	156	441	220	5,364	178	4,067
255	254	Permian Basin Royalty Trust	9,816	130	26,098	47	25,523	203	[61]7,340	—	0

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
214	0.094	274	0.273	234	0.561	295	2.249	211	0.094	273	0.273	232	0.561	293	2.249	—	NA
260	0.047	182	1.476	203	0.948	152	29.07	257	0.047	180	1.476	201	0.948	146	29.07	—	NA
169	0.176	96	8.181	226	0.642	182	17.28	173	0.159	134	3.386	224	0.642	179	17.28	205	0.500
224	0.086	200	1.188	194	1.093	145	34.31	222	0.086	196	1.188	192	1.093	140	34.31	250	0.130
242	0.067	248	0.472	230	0.597	228	7.229	240	0.067	245	0.472	228	0.597	225	7.229	82	14.00
191	0.128	139	3.207	278	[75]0.323	187	[75]16.50	188	0.128	138	3.202	274	[75]0.323	184	[75]16.50	—	NA
261	0.047	202	1.148	309	0.202	236	5.902	258	0.047	197	1.148	305	0.202	234	5.902	—	—
253	0.056	227	0.732	275	0.326	212	10.54	250	0.056	223	0.732	271	0.326	209	10.54	113	5.560
195	0.123	146	3.005	222	0.684	177	20.08	193	0.123	144	3.005	220	0.684	174	20.08	95	8.680
128	0.388	179	1.530	131	3.317	205	12.36	120	0.388	177	1.530	122	3.317	202	12.36	134	3.590
158	0.206	188	1.332	167	1.754	173	21.28	155	0.206	185	1.332	163	1.754	170	21.28	168	1.680
280	0.037	206	1.124	221	0.728	165	23.82	275	0.037	201	1.124	219	0.728	161	23.82	—	NA
187	0.134	174	1.618	205	0.935	162	37.23	189	0.128	239	0.535	215	0.771	297	2.102	199	0.600
278	0.038	267	0.300	334	0.141	312	1.568	273	0.038	265	0.300	329	0.141	310	1.568	162	1.810
165	0.191	222	0.818	154	2.254	219	9.288	162	0.191	217	0.818	150	2.254	216	9.280	227	0.300
281	0.035	204	1.147	251	0.456	215	9.688	277	0.035	199	1.147	248	0.456	212	9.688	220	0.374
228	0.082	228	0.719	179	1.471	207	12.01	226	0.082	224	0.719	175	1.471	204	12.01	108	6.390
222	0.087	184	1.400	253	0.449	188	16.47	220	0.087	182	1.400	250	0.449	185	16.47	—	NA
245	0.063	186	1.362	299	0.236	216	9.655	242	0.063	183	1.362	295	0.236	213	9.655	112	5.800
156	0.207	210	1.048	173	1.580	224	8.614	153	0.207	205	1.048	159	1.580	220	8.614	252	0.114
262	0.047	322	0.094	241	0.532	373	0.232	324	0.016	321	0.094	359	0.052	371	0.232	—	—
93	0.880	109	6.066	95	6.491	134	41.77	87	0.880	104	6.066	88	6.491	129	41.77	—	NA
328	0.015	256	0.400	212	0.883	143	36.99	325	0.015	254	0.400	208	0.883	137	36.99	206	0.500
250	0.057	366	0.031	290	0.273	367	0.326	247	0.057	365	0.031	286	0.273	365	0.326	—	—
159	0.205	189	1.324	259	0.407	325	1.271	156	0.205	186	1.324	255	0.407	322	1.271	228	0.300
246	0.062	232	0.659	297	0.239	278	2.815	243	0.062	228	0.659	293	0.239	276	2.815	—	—
215	0.092	268	0.299	206	0.923	264	3.684	213	0.092	266	0.299	203	0.923	262	3.684	118	5.000
275	0.039	250	0.434	315	0.170	259	4.311	271	0.039	248	0.434	311	0.170	257	4.311	44	35.00
217	0.090	221	0.820	265	0.354	220	9.250	215	0.090	216	0.820	261	0.354	217	9.250	—	—
291	0.030	230	0.665	316	0.169	239	5.427	287	030	227	0.665	312	0.169	237	5.427	—	—
196	0.123	218	0.881	196	1.060	201	12.86	194	0.123	213	0.881	194	1.060	198	12.86	—	NA
211	0.099	201	1.166	177	1.517	221	9.037	212	0.094	219	0.788	174	1.477	229	6.914	137	3.429
166	0.188	244	0.531	163	1.700	244	5.059	163	0.188	241	0.531	164	1.700	242	5.059	—	NA
189	0.133	181	1.496	231	0.589	214	9.873	186	0.133	179	1.496	229	0.589	211	9.873	246	0.180
208	0.101	197	1.205	209	0.890	191	14.92	347	0.009	226	0.672	353	0.058	224	7.334	223	0.320
163	0.195	213	0.978	199	1.000	227	7.426	159	0.195	208	0.978	197	1.000	223	7.426	151	2.460
194	0.125	245	0.497	190	1.193	240	5.208	192	0.125	242	0.497	187	1.193	238	5.208	—	NA
243	[107]0.067	205	[107]1.138	244	0.513	208	11.63	241	[107]0.067	200	[107]1.138	241	0.513	205	11.63	212	[107]0.420
207	0.104	246	0.492	197	1.014	248	4.795	205	0.104	243	0.492	195	1.014	246	4.795	165	1.780
172	0.171	224	0.764	182	1.440	256	4.395	168	0.171	220	0.764	178	1.440	254	4.395	—	NA
—	—	106	6.423	—	—	81	134.8	—	—	100	6.423	—	—	70	134.8	—	—
268	0.044	301	0.145	159	1.994	251	4.544	264	0.044	300	0.145	154	1.994	249	4.544	119	5.000
157	0.207	380	0.010	158	2.054	349	0.541	154	0.207	380	0.010	153	2.054	347	0.541	186	1.000
209	0.100	194	1.279	258	0.410	217	9.592	207	0.100	191	1.279	254	0.410	214	9.592	171	1.450
284	0.034	290	0.215	339	0.118	324	1.307	280	0.034	289	0.215	334	0.118	321	1.307	221	0.351
282	0.035	223	0.811	238	0.544	204	12.57	278	0.035	218	0.811	236	0.544	201	12.57	145	2.817
216	0.091	258	0.381	160	1.965	235	6.173	214	0.091	250	0.381	155	1.965	233	6.173	156	2.241
218	0.090	295	0.170	223	0.666	280	2.744	216	0.090	294	0.170	221	0.666	278	2.744	235	0.250
334	0.013	317	0.104	263	0.378	241	5.158	331	0.013	316	0.104	259	0.378	239	5.158	210	0.470
269	0.044	266	0.303	228	0.622	179	18.72	265	0.044	264	0.303	226	0.622	176	18.72	—	—
74	1.309	126	4.156	55	16.31	133	42.68	68	1.309	122	4.156	47	16.31	128	42.68	—	—

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Rank by total assets 1987	1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
256	227	Trinity Resources Ltd.[109]	9,703	226	4,843	233	(171)	248	3,564	239	1,111
257	242	Summit Energy Inc.[110]	9,673	252	3,124	302	(864)	235	4,459	245	1,029
258	233	Bellwether Exploration Co.[40]	9,637	286	[90]1,577	344	[90](3,238)	355	(450)	304	[90]267
259	250	Cobb Resources Corp.[40]	9,394	277	2,130	245	(245)	212	6,457	250	851
260	265	ZG Energy Corp.[111]	9,357	241	3,908	342	(3,154)	276	2,082	207	1,955
261	260	Com-Tek Resources Inc.[9]	9,335	299	1,282	292	(691)	247	3,738	167	5,172
262	256	Western Energy Development Co. Inc.[112,35]	9,082	294	[113]1,369	351	[113](4,744)	371	(9,813)	315	[113]178
263	—	Xplor Corp.[27]	8,988	253	3,077	204	(49)	199	7,931	343	77
264	281	Castle Energy Corp.[9]	8,940	225	4,870	104	2,502	245	3,890	230	1,356
265	248	Newhall Resources	8,590	219	[114]5,262	126	[114]1,315	204	[107]7,254	333	111
266	259	QED Exploration Inc.[110]	8,578	269	2,331	176	169	213	6,328	232	1,292
267	246	ConVest Energy Corp.	8,565	275	2,224	222	(129)	225	5,075	299	342
268	—	N.Y. Life Oil & Gas Prod. Prop. I-C Ltd.	8,294	263	2,638	237	(198)	201	[107]7,838	144	7,313
269	214	Ratex Resources Inc.[9]	8,180	274	2,227	367	(10,584)	377	(20,749)	329	125
270	—	N.Y. Life Oil & Gas Prod. Prop. II-A LP	8,137	341	660	168	237	202	[107]7,658	152	5,877
271	—	Graham Income Fund 82A L.P.	8,081	270	2,329	164	287	198	[108]8,062	—	NA
272	258	Home-Stake Oil & Gas Co.	7,916	231	4,387	130	1,132	209	6,932	234	1,245
273	278	Nahama & Weagant Energy Co.[13]	7,876	292	1,429	307	(990)	249	3,502	216	1,634
274	220	Lomak Petroleum Inc.	7,687	203	7,475	355	(6,026)	367	(5,925)	175	4,562
275	284	Credo Petroleum Corp.[103]	7,565	327	771	175	182	208	7,054	256	777
276	276	Alta Energy Corp.[40]	7,527	295	1,328	203	(46)	278	2,047	208	1,901
277	—	Search Natural Resources Inc.	7,365	399	34	282	(507)	314	1,042	165	5,182
278	252	Striker Petroleum Corp.	7,322	288	1,548	338	(2,407)	223	5,150	300	325
279	261	Pyramid Oil Co.	7,260	242	3,817	310	(1,034)	214	6,314	248	976
280	286	Whiting Petroleum Corp.	7,169	272	2,246	161	308	218	5,646	241	1,106
281	264	Golden Oil Co.[40]	7,031	285	1,592	270	(389)	222	5,295	319	164
282	271	GeoResources Inc.	6,898	261	2,764	181	105	241	3,980	303	274
283	268	Panhandle Royalty Co.[9]	6,865	259	2,790	152	508	234	4,555	258	765
284	280	Mustang Cos. Inc.	6,638	246	3,500	234	(179)	217	5,769	200	2,300
285	291	Gold King Consolidated Inc.[115]	6,574	291	1,453	257	(305)	228	5,004	219	1,582
286	—	Omni Exploration Inc.[9]	6,516	276	2,172	279	(483)	297	1,471	365	27
287	270	Houston Oil Royalty Trust	6,506	319	830	155	[73]470	211	[61]6,506	—	NA
288	267	Partners Oil Co.	6,431	284	1,594	299	(837)	256	3,217	254	799
289	295	Kelley Oil Corp.	6,333	236	4,103	251	(262)	274	2,118	222	1,557
290	309	Republic Resources Corp.	6,304	303	1,182	258	(310)	309	1,142	373	8
291	285	Prima Energy Corp.[40]	6,287	298	1,298	185	77	221	5,351	288	465
292	257	Basic Earth Science Systems Inc.[35]	6,177	278	1,921	324	(1,534)	270	2,260	271	601
293	—	Eglington Oil & Gas Corp.[116]	6,122	314	915	188	64	370	(9,497)	243	1,078
294	—	Plexus Resources Corp.[40]	6,091	355	510	284	(532)	261	2,822	253	810
295	—	Pinnacle Petroleum Inc.	5,946	310	1,029	298	(786)	244	3,892	296	367
296	273	Petroleum Reserve Corp.[40]	5,888	265	2,522	250	(260)	345	191	356	42
297	296	Burton/Hawks Inc.	5,711	244	3,735	195	16	238	4,136	305	267
298	224	Magic Circle Energy Corp.	5,673	245	3,510	113	1,830	231	4,688	269	668
299	—	Energy Sources Inc.[103]	5,492	308	1,082	325	(1,663)	364	(3,944)	325	137
300	—	N.Y. Life Oil & Gas Prod. Prop. I-A Ltd.	5,396	280	1,894	230	(158)	227	[105]5,060	177	4,179
301	282	Strata Corp.	5,173	266	2,500	326	(1,712)	373	(11,460)	—	NA
302	311	Normandy Oil & Gas Co. Inc.[40]	4,995	324	807	157	417	252	3,381	233	1,276
303	—	N.Y. Life Oil & Gas Prod. Prop. I-D Ltd.	4,992	348	569	184	99	229	[104]4,875	181	3,688
304	277	Altex Industries Inc.[9]	4,928	307	1,083	317	(1,343)	236	4,433	353	49
305	263	Usenco Inc.[103]	4,838	264	2,532	305	(962)	285	1,844	307	255
306	—	Woodbine Petroleum Inc.[9]	4,688	315	914	273	(417)	290	1,686	279	529

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
177	0.159	208	1.101	232	0.585	250	4.549	174	0.159	203	1.101	230	0.585	248	4.549	169	1.660
219	0.090	212	1.009	191	1.161	225	7.591	217	0.090	207	1.009	188	1.161	221	7.591	266	0.020
285	[90]0.033	254	[90]0.407	269	0.343	226	7.511	281	[90]0.033	252	[90]0.407	265	0.343	222	7.511	247	[90]0.170
226	0.085	300	0.146	150	2.354	268	3.355	224	0.085	299	0.146	147	2.354	266	3.355	173	1.340
192	0.127	243	0.532	214	0.852	243	5.104	190	0.127	240	0.532	210	0.852	241	5.104	238	0.209
258	0.050	279	0.243	169	1.637	213	9.945	255	0.050	278	0.243	165	1.637	210	9.945	—	—
203	[113]0.111	328	[113]0.089	187	1.326	285	2.598	201	[113]0.111	327	[113]0.089	184	1.326	283	2.598	—	—
220	0.090	252	0.410	252	0.452	252	4.525	218	0.090	250	0.410	249	0.452	250	4.525	240	0.200
264	0.046	239	0.581	319	0.167	202	12.78	260	0.046	234	0.581	315	0.167	199	12.78	141	3.300
197	0.123	187	1.358	248	0.480	229	7.226	195	0.123	184	1.358	245	0.480	226	7.226	164	1.800
240	0.072	264	0.330	270	0.338	296	2.228	238	0.072	262	0.330	266	0.338	294	2.228	101	7.471
251	0.056	263	0.353	235	0.560	282	2.704	248	0.056	261	0.353	233	0.560	280	2.704	258	0.090
205	0.106	236	0.608	242	0.521	242	5.113	203	0.106	231	0.608	239	0.521	240	5.113	—	NA
304	0.024	209	1.054	281	0.319	249	4.656	300	0.024	204	1.054	277	0.319	247	4.656	—	—
310	0.021	312	0.113	237	0.546	260	4.180	306	0.021	311	0.113	235	0.546	258	4.180	—	NA
206	0.106	216	0.908	243	0.519	245	5.047	204	0.106	211	0.908	240	0.519	243	5.047	—	NA
171	0.172	219	0.872	208	0.902	233	6.733	167	0.172	214	0.872	205	0.902	231	6.733	152	2.350
308	0.023	257	0.386	261	0.384	274	3.082	304	0.023	255	0.386	257	0.384	272	3.082	—	NA
300	0.026	249	0.436	353	0.065	303	1.939	296	0.026	247	0.436	348	0.065	302	1.939	136	3.500
321	0.018	344	0.054	328	0.151	281	2.719	317	0.018	344	0.054	324	0.151	279	2.719	179	1.185
276	0.039	309	0.120	245	0.510	223	8.641	272	0.039	308	0.120	242	0.510	219	8.641	236	0.230
—	NA	—	NA	289	0.278	265	3.569	—	NA	—	NA	285	0.278	263	3.569	—	NA
233	0.080	348	0.048	152	2.308	374	0.227	231	0.080	348	0.048	149	2.308	372	0.227	158	2.070
186	0.139	365	0.034	201	0.968	362	0.408	184	0.139	364	0.034	199	0.968	359	0.408	143	3.000
265	0.046	270	0.293	267	0.349	287	2.571	261	0.046	268	0.293	263	0.349	285	2.571	—	—
247	0.062	283	0.239	186	1.348	310	1.629	244	0.062	282	0.239	183	1.348	308	1.629	—	—
227	0.083	379	0.011	211	0.888	375	0.207	225	0.083	379	0.011	207	0.888	374	0.207	—	—
270	0.044	207	1.118	312	[75]0.190	231	[75]7.048	266	0.044	202	1.118	308	[75]0.190	228	[75]7.048	196	0.664
213	0.096	272	0.275	216	0.803	290	2.509	210	0.096	271	0.275	213	0.803	289	2.509	140	3.320
271	0.043	325	0.091	233	0.585	339	0.824	267	0.043	324	0.091	231	0.585	337	0.824	187	1.000
234	0.080	235	0.618	218	0.758	254	4.483	232	0.080	230	0.618	216	0.758	252	4.483	—	—
311	0.021	285	0.234	317	0.169	263	3.801	307	0.021	284	0.234	313	0.169	261	3.801	—	—
343	0.011	334	0.082	368	0.033	358	0.436	339	0.011	333	0.082	365	0.033	355	0.436	218	0.378
356	0.008	237	0.585	359	0.054	222	8.862	353	0.008	232	0.585	355	0.054	218	8.862	128	4.220
372	0.003	375	0.018	384	0.011	383	0.127	369	0.003	375	0.018	383	0.011	382	0.127	—	—
351	0.009	318	0.104	371	0.031	314	1.558	348	0.009	317	0.104	368	0.031	312	1.558	202	0.560
198	0.122	292	0.193	239	0.537	262	3.926	196	0.122	291	0.193	237	0.537	260	3.926	176	1.240
273	0.040	363	0.035	227	0.630	361	0.413	269	0.040	362	0.035	225	0.630	358	0.413	—	NA
348	0.010	326	0.091	347	0.081	277	2.839	344	0.010	325	0.091	342	0.081	275	2.839	231	0.270
294	0.028	305	0.128	325	0.156	329	1.150	290	0.028	304	0.128	321	0.156	327	1.150	195	0.720
200	0.117	214	0.967	207	0.912	253	4.497	198	0.117	209	0.967	204	0.912	251	4.497	188	1.000
255	0.053	336	0.074	219	0.754	292	2.481	252	0.053	335	0.074	217	0.754	291	2.481	244	0.187
379	0.001	323	0.094	389	0.005	342	0.729	379	0.001	322	0.094	389	0.005	339	0.729	—	—
272	0.042	286	0.226	249	0.474	305	1.816	268	0.042	285	0.226	246	0.474	304	1.816	—	—
236	0.079	251	0.414	255	0.441	273	3.193	234	0.079	249	0.414	251	0.441	271	3.193	—	NA
293	0.029	255	0.406	326	0.153	279	2.805	289	0.029	253	0.406	322	0.153	277	2.805	—	—
335	0.013	313	0.113	293	0.263	315	1.530	332	0.013	312	0.113	289	0.263	313	1.530	189	1.000
309	0.022	316	0.106	268	0.347	275	3.078	305	0.022	315	0.106	264	0.347	273	3.078	—	NA
295	0.028	354	0.044	304	0.216	379	0.172	291	0.028	353	0.044	300	0.216	378	0.172	—	—
229	0.082	280	0.240	156	2.114	267	3.359	227	0.082	279	0.240	152	2.114	265	3.359	241	0.200
312	0.021	273	0.275	302	0.220	266	3.543	308	0.021	272	0.275	298	0.220	264	3.543	217	0.380

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Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Total revenue Rank	Total revenue $000	Net income Rank	Net income $000	Stockholders' equity Rank	Stockholders' equity $000	Capital & Expl. spending Rank	Capital & Expl. spending $000
307	298	Dallas Oil & Minerals Inc.	4,681	297	1,308	238	(207)	233	4,595	231	1,297
308	301	Greenwood Holdings Inc.	4,571	249	[117]3,300	102	[117]2,593	254	3,346	264	[117]713
309	290	Great Eastern Energy & Development Corp.	4,406	283	1,655	243	(235)	240	4,050	240	1,111
310	—	Comstock Resources Inc.	4,381	364	379	277	(462)	283	1,917	198	2,507
311	294	Monogram Oil & Gas Inc.[103]	4,344	300	1,254	219	(124)	366	(5,003)	367	22
312	297	Wexco of Delaware Inc.[118]	4,325	302	1,196	283	(513)	253	3,379	252	825
313	300	Parallel Petroleum Corp.	4,286	329	764	252	(268)	258	3,097	255	784
314	289	Wepco Energy Co.	4,089	311	986	311	(1,066)	272	2,147	311	234
315	304	Energy Capital Development Corp.	3,890	352	529	303	(889)	311	1,101	331	120
316	299	K.R.M. Petroleum Corp.	3,742	279	1,909	315	(1,173)	262	2,727	242	1,084
317	321	Ranger Oil Ltd.[51]	3,656	325	806	167	[44]256	—	NA	—	NA
318	—	Senergy 1986 Ltd.	3,593	333	720	354	(5,887)	250	[10]3,495	154	5,781
319	302	Kimco Energy Corp.[119,40]	3,590	290	1,515	319	(1,454)	295	1,480	238	1,112
320	312	Southern Mineral Corp.	3,547	267	2,389	159	361	259	2,995	218	1,595
321	313	Tyrex Oil Co.[40]	3,488	306	1,122	226	(145)	255	3,277	229	1,385
322	—	Energetics Inc.	3,470	353	529	274	(419)	281	1,997	266	691
323	308	Arch Petroleum Inc.[120,103]	3,372	312	[121]975	162	[121]303	291	1,626	342	[121]78
324	—	N.Y. Life Oil & Gas Prod. Prop. I-B Ltd.	3,344	301	1,227	223	(129)	257	[10]3,103	188	3,256
325	—	International Basic Resources Inc.[40]	3,287	394	80	268	(355)	313	1,057	314	194
326	—	Wright Brothers Energy Inc.[105]	3,223	282	1,699	278	(468)	299	1,431	316	171
327	327	Appalachian Oil & Gas Co. Inc.[40]	3,180	271	2,267	158	417	320	805	272	596
328	293	Valex Petroleum Inc.	3,114	304	1,158	341	(3,142)	331	644	257	775
329	336	Questa Oil & Gas Co.	3,068	313	970	216	(108)	292	1,550	267	672
330	322	Chaparral Resources Inc.[65]	3,055	323	814	271	(391)	275	2,104	286	485
331	345	Impact Energy Inc.	2,974	381	211	269	(374)	306	1,212	298	346
332	305	NP Energy Corp.[35]	2,886	387	173	224	(137)	308	1,162	366	25
333	316	Aspen Exploration Corp.[40]	2,858	356	468	246	(247)	263	2,709	345	71
334	315	Crescent Oil & Gas Corp.[9]	2,631	362	420	297	(767)	271	2,223	338	85
335	360	HarCor Energy Inc.[122]	2,574	296	1,317	198	1	269	2,293	292	416
336	340	Western Energy Resources Inc.	2,552	373	269	285	(532)	265	2,494	237	1,124
337	324	Pantepec International Inc.	2,543	386	183	247	(249)	267	2,457	—	0
338	—	Argosy Energy Inc.	2,535	346	603	262	(325)	277	2,074	287	466
339	333	Keldon Oil Co.[110]	2,529	331	736	202	(34)	326	708	376	7
340	323	Penn-Pacific Corp.[9]	2,527	367	336	165	259	268	2,391	—	0
341	329	Double Eagle Petroleum & Mining Co.[27]	2,321	320	827	221	(128)	273	2,136	281	521
342	328	Intramerican Oil & Minerals Inc.	2,269	332	722	256	(303)	286	1,837	332	114
343	—	Broken Arrow Petroleum Co.[19]	2,259	351	545	182	102	287	1,828	306	260
344	346	Taurus Petroleum Inc.[9]	2,167	316	905	264	(335)	316	1,000	276	575
345	318	Plano Petroleum Corp.[9]	2,150	357	465	287	(604)	279	2,007	285	506
346	310	Roseland Oil & Gas Inc.[9]	2,135	360	[123]429	201	[123](25)	307	1,173	337	[123]98
347	332	Nova Natural Resources Corp.[9]	2,122	338	669	239	(207)	280	2,004	341	79
348	319	Roberts Oil & Gas Inc.[19]	2,062	354	516	313	(1,112)	347	110	291	434
349	242	Summit Petroleum Corp.[110]	2,042	396	62	261	(323)	346	162	372	10
350	341	Petrol Industries Inc.	2,027	287	1,567	166	259	284	1,902	371	16
351	337	Albion International Resources Inc.	2,003	369	327	186	75	282	1,948	362	31
352	351	Pioneer Oil & Gas Corp.[9]	1,946	321	822	178	160	298	1,459	294	389
353	—	Hailey Energy Corp.	1,933	368	335	335	(2,235)	305	1,243	320	164
354	325	Energy Resources of North Dakota Inc.[35]	1,917	334	704	235	(185)	289	1,712	308	250
355	307	Twin Richfield Oils Inc.[51]	1,888	379	220	275	(455)	350	(10)	—	0
356	—	Struthers Oil & Gas Corp.	1,852	335	701	96	2,981	349	37	339	84
357	342	General Energy Resources & Technology Corp.[124]	1,846	317	895	211	(70)	321	797	317	169

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
289	0.031	265	0.321	305	0.214	300	1.968	285	0.031	263	0.321	301	0.214	299	1.968	263	0.059
263	[117]0.047	302	[117]0.136	294	0.256	289	2.522	259	[117]0.047	301	[117]0.136	290	0.256	288	2.522	57	[117]23.00
257	0.051	327	0.091	285	[75]0.292	317	[75]1.513	254	0.051	326	0.091	281	[75]0.292	315	[75]1.513	139	3.400
380	0.001	—	—	250	0.457	372	0.250	380	0.001	—	—	247	0.457	370	0.250	—	NA
329	0.015	253	0.410	360	0.054	284	2.684	326	0.015	251	0.410	356	0.054	282	2.684	—	—
286	0.032	275	0.261	332	0.146	326	1.216	282	0.032	274	0.261	328	0.146	324	1.216	181	1.170
320	0.019	288	0.219	276	0.325	298	2.183	316	0.019	287	0.219	272	0.325	296	2.183	177	1.200
296	0.027	294	0.185	286	0.283	302	1.942	292	0.027	293	0.185	282	0.283	301	1.942	267	0.020
367	0.004	335	0.082	273	0.331	218	9.487	364	0.004	334	0.082	269	0.331	215	9.487	—	—
237	0.079	262	0.369	280	0.320	237	5.532	235	0.079	260	0.369	276	0.320	235	5.532	182	1.170
287	0.032	296	0.169	322	0.163	359	0.433	283	0.032	295	0.169	318	0.163	356	0.433	242	0.200
305	0.024	299	0.152	320	0.167	321	1.344	301	0.024	298	0.152	316	0.167	318	1.344	—	NA
235	0.080	355	0.044	274	0.329	380	0.157	233	0.080	354	0.044	270	0.329	379	0.157	192	0.810
297	0.027	217	0.885	346	[75]0.085	238	[75]5.482	293	0.027	212	0.885	341	[75]0.085	236	[75]5.482	149	2.608
283	0.035	362	0.039	296	0.248	357	0.445	279	0.035	361	0.039	292	0.248	354	0.445	—	—
362	0.005	345	0.053	340	0.114	323	1.314	359	0.005	345	0.053	335	0.114	320	1.314	—	NA
301	[121]0.026	304	[121]0.129	217	0.779	313	1.566	297	[121]0.026	303	[121]0.129	214	0.779	311	1.566	257	[121]0.100
259	0.049	271	0.284	303	0.220	297	2.218	256	0.049	270	0.284	299	0.220	295	2.218	—	NA
—	—	360	0.040	—	—	309	1.650	—	—	359	0.040	—	—	307	1.650	—	NA
324	0.017	241	0.545	323	0.159	200	13.36	320	0.017	235	0.545	319	0.159	197	13.36	207	0.500
387	(s)	203	1.148	392	0.001	232	6.840	387	(s)	198	1.148	392	0.001	230	6.840	144	2.835
256	0.053	297	0.168	204	0.942	291	2.494	253	0.053	296	0.168	202	0.942	290	2.494	—	—
344	0.011	281	0.240	356	[75]0.061	272	[75]3.267	340	0.011	280	0.240	351	[75]0.061	270	[75]3.267	120	1.619
352	0.009	303	0.132	327	0.152	270	3.272	349	0.009	302	0.132	323	0.152	268	3.272	—	—
336	0.013	—	—	344	0.098	—	—	333	0.013	—	—	339	0.098	—	—	—	—
385	0.001	307	0.124	338	0.122	258	4.363	385	0.001	306	0.124	333	0.122	256	4.363	—	—
313	0.021	376	0.018	292	0.268	348	0.619	309	0.021	376	0.018	288	0.268	346	0.619	262	0.065
368	0.004	298	0.156	374	0.028	261	4.172	365	0.004	297	0.156	371	0.028	259	4.172	193	0.810
292	0.030	259	0.378	277	0.324	299	2.042	288	0.030	257	0.378	273	0.324	298	2.042	—	—
353	0.009	333	0.084	306	0.206	308	1.741	350	0.009	332	0.084	302	0.206	306	1.741	—	—
381	0.001	329	0.088	385	0.011	306	1.787	381	0.001	328	0.088	384	0.011	323	1.271	191	0.830
244	0.066	—	—	254	0.447	390	0.060	371	0.002	—	—	385	0.010	390	0.060	—	—
314	0.021	321	0.096	264	0.365	330	1.060	310	0.021	320	0.096	260	0.365	328	1.060	—	—
360	0.007	314	0.111	345	0.096	318	1.487	357	0.007	313	0.111	340	0.096	316	1.487	—	—
288	0.032	368	0.028	301	0.221	331	1.058	284	0.032	367	0.028	297	0.221	329	1.058	200	0.570
330	0.014	282	0.240	314	0.179	276	3.035	327	0.014	281	0.240	310	0.179	274	3.035	254	0.108
—	—	384	0.006	—	—	328	1.167	—	—	384	0.006	—	—	326	1.167	—	—
315	0.021	289	0.217	329	0.150	319	1.431	311	0.021	288	0.217	325	0.150	317	1.431	—	—
331	0.014	347	0.052	352	0.070	336	0.911	328	0.014	347	0.052	347	0.070	334	0.911	123	4.670
339	[123]0.012	353	[123]0.045	337	0.130	368	0.314	335	[123]0.012	352	[123]0.045	332	0.130	366	0.314	—	NA
325	0.017	352	0.046	321	0.165	351	0.526	321	0.017	351	0.046	317	0.165	349	0.526	249	0.140
349	0.010	284	0.239	370	0.032	316	1.523	345	0.010	283	0.239	367	0.032	314	1.523	269	0.012
374	0.002	374	0.019	349	0.079	334	0.975	372	0.002	374	0.019	344	0.079	332	0.975	—	NA
232	0.081	2	0.024	100	6.241	363	0.407	230	0.081	372	0.024	91	6.241	360	0.407	—	—
340	0.01	358	0.041	284	0.297	332	1.017	336	0.012	357	0.041	280	0.297	330	1.017	—	
179	0.151	308	0.124	295	0.252	293	2.377	176	0.151	307	0.124	291	0.252	292	2.377	—	NA
388	(s)	367	0.031	377	0.024	335	0.922	388	(s)	366	0.031	375	0.024	333	0.922	—	NA
303	0.025	388	0.003	324	0.158	394	0.009	299	0.025	388	0.003	320	0.158	394	0.009	233	0.260
—	—	311	0.114	—	—	311	1.613	—	—	310	0.114	—	—	309	1.613	—	—
363	0.005	269	0.296	390	0.004	364	0.384	360	0.005	267	0.296	390	0.004	361	0.384	272	0.001
298	0.027	310	0.119	342	0.107	322	1.320	294	0.027	309	0.119	337	0.107	319	1.320	270	0.010

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Rank by total assets 1987	Rank by total assets 1986	Company	Total assets $000	Rank	Total revenue $000	Rank	Net income $000	Rank	Stockholders' equity $000	Rank	Capital & Expl. spending $000
358	314	Columbine Exploration Corp.	1,837	293	[125]1,415	322	[125](1,483)	362	(2,683)	349	[125]63
359	339	Castle Royalty L.P.	1,812	374	248	213	(96)	288	[10]1,787	—	0
360	317	Lyric Energy Inc.[105]	1,786	365	570	337	(2,317)	358	(746)	350	55
361	—	Calcasieu Real Estate & Oil Co. Inc.	1,739	340	664	163	298	294	1,499	361	32
362	306	Oxford Consolidated Inc.[35]	1,724	305	1,142	312	(1,090)	335	522	274	583
363	343	Willard Pease Oil & Gas Co.	1,705	345	604	236	(193)	338	451	335	100
364	320	Exploration Co.[27]	1,685	385	194	330	(1,971)	334	552	265	692
365	347	Big Piney Oil & Gas Co.	1,621	382	199	207	(54)	293	1,504	374	8
366	—	Morrison Nuclear Inc.[126]	1,598	328	770	199	0	363	(3,432)	369	19
367	—	Cap Ltd.	1,581	326	778	170	212	301	[10]1,370	324	139
368	—	Gladstone Resources Inc.	1,555	395	73	210	(61)	303	1,330	—	0
369	—	International Management & Research Corp.	1,513	388	159	288	(605)	323	784	347	66
370	355	Hubco Exploration Inc.	1,483	347	602	215	(104)	353	(312)	284	510
371	358	Sheffield Exploration Co. Inc.[40]	1,433	318	892	225	(143)	310	1,111	273	587
372	366	Golden Triangle Royalty & Oil Inc.	1,410	391	111	263	(330)	302	1,362	330	125
373	364	Cheyenne Resources Inc.	1,324	378	227	254	(297)	325	727	310	237
374	348	Reserve Exploration Co.[35]	1,252	358	455	229	(155)	341	378	354	46
375	361	Sharon Energy Ltd.[35]	1,237	337	685	190	35	352	(230)	283	511
376	—	DOL Resources Inc.	1,223	390	132	217	(114)	333	634	—	0
377	359	EMC Energies Inc.[40]	1,206	366	348	227	(152)	336	512	348	65
378	352	Toklan Oil Corp.[27]	1,193	330	761	240	(212)	328	690	323	146
379	349	Love Oil Co. Inc.[19]	1,173	380	212	280	(499)	315	1,011	275	580
380	—	Bogert 1985-III L.P.	1,168	344	616	253	(292)	317	[10]988	—	0
381	369	TPEX Exploration Inc.[40]	1,094	361	423	232	(167)	329	686	318	167
382	356	Wicklund Holding Co.[127]	1,089	372	286	255	(297)	319	825	377	5
383	—	REO Production I-A L.P.	1,083	398	53	197	2	312	[10]1,075	247	1,013
384	350	International Royalty & Oil Co.[9]	1,050	389	135	304	(950)	359	(844)	351	51
385	368	Bolyard Oil & Gas Ltd.[105]	1,019	375	242	212	(85)	339	435	364	28
386	387	Texas Vanguard Oil Co.	1,018	349	567	179	131	330	675	313	198
387	363	Carmel Energy Inc.	1,014	342	656	200	(10)	344	205	—	0
388	354	Eagle Exploration Co.[35]	1,008	350	552	309	(1,000)	368	(6,241)	326	137
389	—	Loch Exploration Inc.	1,002	397	58	281	(505)	357	(720)	—	NA
390	—	National Petroleum Corp. Ltd.[65,66]	1,000	370	311	260	(319)	348	47	370	18
391	—	Minex Resources Inc.[65]	967	392	108	194	28	318	894	363	31
392	—	Texoil Inc.	960	377	228	259	(316)	342	344	346	69
393	365	Bengal Oil & Gas Corp.	936	383	197	272	(393)	354	(367)	336	100
394	370	Tri-Valley Corp.[110]	833	343	617	248	(251)	343	296	309	238
395	—	Winco Petroleum Corp.[9]	801	393	98	208	(59)322		787	358	34
396	382	Amacan Resources Corp.[105]	780	371	303	189	57	324	769	368	21
39	374	Oil City Petroleum Inc.[27]	765	376	242	265	(348)	340	391	357	40
398	381	Yellowstone Resources Inc.	727	384	197	209	(60)	327	693	328	136
399	375	Hipoint Investments Ltd.	724	359	442	276	(457)	376	(20,069)	340	81
400	—	Rotan Mosle Energy Fund III Ltd.	646	339	666	192	34	332	[10]636	359	34
		Totals	501,191,474		445,743,989		9,371,547		172,805,668		41,630,248

NA = Not Available. (s) indicates less than 500 bbl or 500 mcf. Fiscal yearend is Dec. 31 unless otherwise noted. 1. At fiscal yearend, was operating under Chapter 11. Emerged from Chapter 11 on 4-7-88. 2. Formerly Standard Oil. Subsidiary of British Petroleum Co. plc. 3. Includes 2 operating entities -- Marathon Oil and Texas Oil & Gas. 4. Operating income before foreign income taxes. 5. Subsidiary of E. I. du Pont de Nemours & Co. 6. After tax operating income. 7. Includes production and reserves attributed to both natural gas systems and exploration and production operations. 8. Wells attributable to exploration and production operations only. 9. Fiscal yearend Sep. 30. 10. Partners' capital. 11. May include insignificant amounts outside U.S. 12. Subsidiary of Burlington Northern Inc. 13. Fiscal yearend Jan. 31, 1988. 14. Formerly Diamond Shamrock. Refining operations were spun-off to form Diamond Shamrock R & M Inc. 15. Subsidiary of Union Pacific Corp. Since fiscal yearend has purchased Beard Corp. 16. Includes both cost of service and non-cost of service activities. 17. Unocal owns 86.04% of outstanding partnership units. 18. Subsidiary of Broken Hill Proprietary Co. Ltd. 19. Fiscal yearend May 31. 20. Enserch owns 87% of outstanding partnership units. 21. Transco owns 73% of outstanding partnership units. 22. Freeport-McMoRan owns 59% of outstanding partnership units. 23. Subsidiary of Santa Fe Southern Pacific. 24. Includes small amounts attributable to coal and lumber operations. 25. Operating income. 26. Murphy Oil owns 61% of outstanding stock. 27. Fiscal yearend Aug. 31. 28. Subsidiary of W.R. Grace & Co. 29. Identifiable assets. 30. Subsidiary of Newmont Mining. 31. Since fiscal yearend, company has announced plans to sell all oil and gas reserves. 32. Partners' capital less demand notes receivable. 33. Apache owns approximately 6.1% of outstanding partnership units. 34. Formerly Pacific Lighting Oil & Gas. Subsidiary of Pacific Enterprises. Since fiscal yearend has purchased Sabine. 35. Fiscal yearend Mar. 31. 36. Santa Fe Energy owns 82% of outstanding partnership units. 37. Subsidiary of CSX Corp. Since fiscal yearend all oil and gas operations have been sold to Total Minatome. 38. Maxus owns 81% of outstanding partnership units. 39. Company is an asset based holding company which is 82% owned by Cortez International. 40. Fiscal yearend June 30. 41. Capital and members' equity. 42. Subsidiary of Total Compagnie Francaise des Petroles. Since the fiscal yearend has been purchased by Pacific Enterprises. 46. Subsidiary of Southdown Inc. 47. Subsidiary of Houston Industries Inc. 48. Operating income before corporate overhead and interest. 49. Damson Oil owns 16.39% of outstanding partnership units. 50. Subsidiary of CMS Energy Corp. 51. U.S. operations only. 52. Subsidiary of Placer Dome Inc. 53. Subsidiary of Hiram Walker Resources Ltd. 54. Net operating income. 55. Subsidiary of PG Group Inc. 56. At fiscal yearend was subsidiary of Moore McCormack Resources. Since then has been purchased by Canadian Occidental Petroleum Ltd. 57. Kaneb Services owns 81.3% of outstanding partnership units. 58. Six months ended Dec. 31. 59. Subsidiary of Pacific Gas & Electric Co.

Worldwide liquids production		Worldwide natural gas production		Worldwide liquids reserves		Worldwide natural gas reserves		U.S. liquids production		U.S. natural gas production		U.S. liquids reserves		U.S. natural gas reserves		U.S. net wells drilled	
Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Mill bbl	Rank	Bcf	Rank	Wells
290	[125]0.031	338	[125]0.068	298	0.238	344	0.698	286	[125]0.031	337	[125]0.068	294	0.238	342	0.698	—	—
361	0.006	350	0.047	367	0.035	360	0.431	358	0.006	349	0.047	364	0.035	357	0.431	—	—
364	0.005	339	0.064	330	0.147	269	3.318	361	0.005	339	0.064	326	0.147	267	3.318	219	0.376
369	0.004	369	0.028	388	0.007	382	0.141	366	0.004	368	0.028	388	0.007	381	0.141	248	0.150
266	0.045	293	0.193	310	0.195	392	0.033	262	0.045	292	0.193	306	0.195	392	0.033	215	0.398
306	0.024	320	0.100	291	0.269	301	1.957	302	0.024	319	0.100	287	0.269	300	1.957	—	—
357	0.008	351	0.047	380	0.022	376	0.206	354	0.008	350	0.047	378	0.022	375	0.206	—	—
—	—	324	0.093	—	—	307	[75]1.748	—	—	323	0.093	—	—	305	[75]1.748	—	NA
267	0.045	386	0.004	335	0.140	—	—	263	0.045	386	0.004	330	0.140	—	—	—	—
316	0.021	278	0.246	350	0.075	333	1.004	312	0.021	277	0.246	345	0.075	331	1.004	—	—
373	0.003	382	0.009	362	[75]0.053	283	[75]2.694	370	0.003	382	0.009	358	[75]0.053	281	[75]2.694	—	—
—	—	364	0.035	—	—	352	0.488	—	—	363	0.035	—	—	350	0.488	—	NA
322	0.018	332	0.085	313	0.184	345	0.676	318	0.018	331	[illegible]	309	0.184	343	0.676	222	0.323
302	0.026	319	0.103	308	0.203	343	0.710	298	0.026	318	[illegible]	304	0.203	340	0.710	—	—
383	0.001	385	0.006	386	0.008	388	0.065	383	0.001	385	0.006	386	0.008	388	0.065	—	—
354	0.009	370	0.025	343	0.104	365	0.341	351	0.009	370	0.025	338	0.104	362	0.341	194	0.750
299	0.027	373	0.022	311	0.194	384	0.121	295	0.027	373	0.022	307	0.194	383	0.121	208	0.500
326	0.017	342	0.059	341	0.113	355	0.468	322	0.017	342	0.059	336	0.113	352	0.468	175	1.250
370	0.004	371	0.025	364	0.041	378	0.199	367	0.004	371	0.025	361	0.041	377	0.199	—	—
341	0.012	356	0.043	336	0.137	353	0.476	337	0.012	355	0.043	331	0.137	351	0.476	—	—
345	0.011	277	0.248	331	0.147	338	0.899	341	0.011	276	0.248	327	0.147	336	0.899	237	0.224
358	0.008	390	0.001	372	0.030	393	0.011	355	0.008	390	0.001	369	0.030	393	0.011	201	0.570
332	0.014	276	0.258	354	0.064	320	1.349	329	0.014	275	0.258	349	0.064	386	0.085	—	—
323	0.018	330	0.087	361	0.054	356	0.452	319	0.018	329	0.087	357	0.054	353	0.452	—	—
375	0.002	331	0.086	379	0.023	347	0.627	373	0.002	330	0.086	377	0.023	345	0.627	260	0.079
376	0.002	383	0.008	375	0.028	341	0.798	374	0.002	383	0.008	372	0.028	338	0.798	—	—
382	0.001	377	0.015	387	[75]0.008	377	[75]0.200	382	0.001	377	0.015	387	[75]0.008	376	[75]0.200	—	—
377	0.002	341	0.061	383	0.013	304	1.834	375	0.002	341	0.061	382	0.013	303	1.834	—	—
333	0.014	357	0.043	287	0.282	327	1.188	330	0.014	356	0.043	283	0.282	325	1.188	69	18.45
277	0.039	—	—	266	0.350	—	NA	276	0.036	—	—	262	0.350	—	—	—	—
307	0.024	337	0.074	369	0.033	381	0.153	303	0.024	336	0.074	366	0.033	380	0.153	176	1.188
366	0.004	378	0.013	363	0.052	371	0.269	363	0.004	378	0.013	360	0.052	369	0.269	—	—
338	0.012	349	0.048	333	0.140	354	0.469	376	0.002	369	0.026	373	0.028	364	0.336	—	—
378	0.002	391	0.001	348	0.080	386	0.090	377	0.002	391	0.001	343	0.080	385	0.090	—	NA
365	0.005	340	0.064	376	0.027	369	0.313	362	0.005	340	0.064	374	0.027	367	0.313	159	2.000
386	(s)	306	0.128	391	0.003	346	0.667	386	(s)	305	0.128	391	0.003	344	0.667	—	—
389	(s)	343	0.059	—	—	385	0.111	389	(s)	343	0.059	—	—	384	0.111	160	2.000
371	0.004	389	0.001	378	0.023	391	0.052	368	0.004	389	0.001	376	0.023	391	0.052	—	—
350	0.010	361	0.040	358	0.057	370	0.302	346	0.010	360	0.040	354	0.057	368	0.302	253	0.110
346	0.011	387	0.004	351	0.071	387	0.081	342	0.011	387	0.004	346	0.071	387	0.081	—	—
359	0.008	381	0.010	366	0.038	389	0.065	356	0.008	381	0.010	363	0.038	389	0.065	203	0.544
337	0.013	346	0.053	365	0.041	366	0.337	334	0.013	346	0.053	362	0.041	363	0.337	251	0.130
347	0.011	287	0.221	381	[75]0.020	350	[75]0.534	343	0.011	286	0.221	379	[75]0.020	348	[75]0.534	—	NA
	3,743.5		13,449.6		36,237.4		168,880.9		2,343.5		10,226.8		23,182.6		115,239.8		9,543.4

60. Subsidiary of Pacificorp. 61. Trust corpus. 62. Net productive wells only. 63. Since fiscal yearend has purchased all oil and gas operations of Kirby Exploration. 64. Subsidiary of CBI Industries Inc. 65. Fiscal yearend Nov. 30. 66. Financial data converted from Canadian dollars using exchange rates in effect at fiscal yearend. 67. Since fiscal yearend has sold oil and gas operations to American Exploration Co. 68. Includes acquisition of Houston Oil Fields Corp. 69. Damson Oil owns 10.52% of outstanding partnership units. 70. Since fiscal yearend has merged with Union Pacific Resources. 71. Damson Oil owns 6.36% of outstanding partnership units. 72. Apache owns 3.5% of outstanding partnership units. 73. Distributable cash. 74. Year ended Oct. 31. 75. Proved developed only. 76. Subsidiary of Washington Energy. 77. Revenue from unaffiliated customers only. 78. Since fiscal yearend has merged with Snyder Oil Partners. 79. Formerly Leader Development Corp. 80. Subsidiary of Brooklyn Union Gas. 81. Formerly American Quasar Petroleum. 82. Subsidiary of Gulf Resources & Chemical Corp. 83. Kelley Oil owns approximately 3.61% of outstanding partnership units. 84. Formerly Entex Energy Development Ltd. 85. Subsidiary of Northwest Natural Gas Co. 86. Subsidiary of Public Service Co. of Colorado. 87. Callon Petroleum owns 9% of outstanding partnership units. 88. Oil and gas operations only. Subsidiary of Penn Virginia Corp. 89. Operating profit before taxes, interest, depreciation and depletion. 90. Six months ended June 30. 91. U.S. subsidiary of Coho Resources Ltd. 92. Subsidiary of MDU Resources Group. 93. Subsidiary of Deminex Deutsche Erdoelversorgungs GmbH. 94. Saxon Oil owns 67% of outstanding partnership units. 95. Consolidated Oil & Gas owns 61% of outstanding partnership units. 96. ConVest owns 21.5% of outstanding partnership units. 97. Year ended Sep. 1. 98. U.S. operations of Inter-City Gas Corp. — Resources Div. 99. Formerly Zim Energy Corp. 100. Subsidiary of Energen Corp. 101. Subsidiary of Bridge Oil Ltd. 102. Fiscal yearend Feb. 29, 1988. 103. Fiscal yearend Oct. 31. 104. Subsidiary of Canada Northwest Energy Ltd. 105. Fiscal yearend Apr. 30. 106. Subsidiary of Sparton Corp. 107. Eight months ended Aug. 31. 108. Formerly Wichita Industries. 109. Canadian company which operates exclusively in U.S. 110. Fiscal yearend July 31. 111. Formerly Burkhart Petroleum Corp. 112. Since fiscal yearend has merged with Oxford Consolidated. 113. Fifteen months ended Mar. 31. 114. Historical cost basis. 115. Formerly Gerber Energy International. 116. Data includes Osceola Oil & Gas Corp. Both are subsidiaries of Eglington Exploration plc. 117. Fifteen months ended Mar. 31. 118. Subsidiary of WICOR Inc. 119. Formerly Henry Energy Corp. 120. Since fiscal yearend has merged with Usenco. 121. Ten months ended Oct. 31. 122. Formerly Pangea Petroleum Corp. 123. Eight months ended Sep. 30. 124. Formerly Reef Energy Corp. 125. Thirteen months ended Dec. 31. 126. U.S. operating subsidiary of Morrison Petroleums Ltd. 127. Formerly Wicklund Petroleum Corp.

The OGJ400 Company Index

Rank by total assets	Company name	Headquarters city
230	Adams Resources & Energy Inc.	Houston
73	Adobe Resources Corp.	New York
165	Alamco Inc.	Clarksburg, WV
351	Albion International Resources Inc.	Laguna Beach, CA
191	Alexander Energy Corp.	Oklahoma City
98	Allegheny & Western Energy Corp.	Charleston, WV
276	Alta Energy Corp.	Midland
304	Altex Industries Inc.	Denver
396	Amacan Resources Corp.	Salt Lake City
207	Amax Oil & Gas Inc.	Houston
19	Amerada Hess Corp.	New York
127	American Exploration Co.	Houston
215	American National Petroleum Co.	Houston
37	American Petrofina Inc.	Dallas
6	Amoco Corp.	Chicago
43	Anadarko Petroleum Corp.	Houston
69	Apache Corp.	Denver
147	Apache Offshore Investment Partnereship	Denver
72	Apache Petroleum Co. L.P.	Denver
327	Appalachian Oil & Gas Co. Inc.	Chattanooga, TN
323	Arch Petroleum Inc.	Fort Worth
8	ARCO (Atlantic Richfield Corp.)	Los Angeles
338	Argosy Energy Inc.	Salt Lake City
29	Arkla Inc.	Shreveport
21	Ashland Oil Inc.	Ashland, KY
333	Aspen Exploration Corp.	Denver
111	Avalon Corp.	New York
212	Barrett Resources Corp.	Denver
214	Baruch-Foster Corp.	Dallas
292	Basic Earth Science Systems Inc.	Englewood, CO
141	Beard Co.	Oklahoma City
228	Beicor Inc.	Irvine, CA
204	Belden & Blake Energy Co.	North Canton, OH
258	Bellwether Exploration Co.	Houston
393	Bengal Oil & Gas Corp.	London, U.K.
139	Berry Petroleum Co.	Taft, CA
45	BHP Petroleum (Americas) Inc.	Houston
365	Big Piney Oil & Gas Co.	Salt Lake City
380	Bogert 1985-III L.P.	Oklahoma City
156	Bogert Oil Co.	Oklahoma City
385	Bolyard Oil & Gas Ltd.	Denver
7	BP America	Cleveland
219	Bridge Oil (USA) Inc.	San Antonio
248	Brock Exploration Corp.	New Orleans
343	Broken Arrow Petroleum Co.	Scottsdale, AZ
297	Burton/Hawks Inc.	Casper, WY
42	Cabot Corp.	Waltham, MA
361	Calcasieu Real Estate & Oil Co. Inc.	Lake Charles, LA
178	Callon Consolidated Partners L.P.	Natchez, MS
229	Callon Petroleum Co.	Natchez, MS
154	Calumet Industries Inc.	Chicago
367	Cap Ltd.	Oklahoma City
387	Carmel Energy Inc.	Houston
264	Castle Energy Corp.	Blue Bell, PA
359	Castle Royalty L.P.	Kansas City, MO
62	CENEX	St. Paul, MN
330	Chaparral Resources Inc.	Denver
181	Chapman Energy Inc.	Dallas
3	Chevron Corp.	San Francisco
373	Cheyenne Resources Inc.	Cheyenne, WY
133	Chieftain Development Co. Ltd.	Edmonton, Alta., Can.
163	Clinton Gas Systems Inc.	Columbus, OH
17	Coastal Corp.	Houston
259	Cobb Resources Corp.	Albuquerque
189	Coho Resources Inc.	Dallas
18	Columbia Gas System Inc.	Wilmington, DE
221	Columbian Energy Co. L.P.	Topeka, KS
358	Columbine Exploration Corp.	Denver
310	Comstock Resources Inc.	Dallas
261	Com-Tek Resources Inc.	Denver
16	Conoco Inc.	Houston
101	Conquest Exploration Co.	Houston
199	Consolidated Energy Partners L.P.	Denver
22	Consolidated Natural Gas Co.	Pittsburgh
132	Consolidated Oil & Gas Inc.	Denver
267	ConVest Energy Corp.	Houston
202	ConVest Energy Partners Ltd.	Houston
275	Credo Petroleum Corp.	Denver
334	Crescent Oil & Gas Corp.	Denver
131	Crystal Oil Co.	Shreveport
80	CSX Oil & Gas Corp.	Houston
227	Daleco Resources Corp.	Los Angeles
307	Dallas Oil & Minerals Inc.	Fort Worth
96	Damson Energy Co. L.P.	New York
138	Damson Income Energy L.P.	New York
145	Damson Institutional Energy L.P.	New York
115	Damson Oil Corp.	New York
87	Dekalb Energy Cos.	Dekalb, IL
193	Deminex US Oil Co.	Dallas
184	Devon Resource Investors L.P.	Oklahoma City
173	DI Industries Inc.	Houston
82	Diamond Shamrock Offshore Partners	Dallas
58	Diversified Energies Inc.	Minneapolis
376	DOL Resources Inc.	Dallas
245	Dorchester Hugoton Ltd.	Dallas
341	Double Eagle Petroleum & Mining Co.	Casper, WY
388	Eagle Exploration Co.	Denver
293	Eglington Oil & Gas Corp.	Fort Worth
377	EMC Energies Inc.	Casper, WY
322	Energetics Inc.	Englewood, CO
233	Energy Assets International Corp.	Houston
315	Energy Capital Development Corp.	Rosslyn, VA
242	Energy Management Corp.	Denver
354	Energy Resources of North Dakota Inc.	Williston, ND
299	Energy Sources Inc.	Lubbock, TX
183	Enex Resources Corp.	Kingwood, TX
15	Enron Corp.	Houston
23	Enserch Corp	Dallas
46	Enserch Exploration Partners Ltd.	Dallas
119	Ensource Inc.	Houston
197	Equitable Petroleum Corp.	New York
54	Equitable Resources Inc.	Pittsburgh
151	Equity Oil Co.	Salt Lake City
169	Ethyl Corp. (Oil & Gas Division)	Baton Rouge, LA
246	Evergreen Resources Inc.	Denver
364	Exploration Co.	San Antonio
140	Exploration Co. of Louisiana Inc.	Lafayette, LA
1	Exxon Corp.	New York
254	Falcon Oil & Gas Co. Inc.	Odessa, TX
195	Federated Natural Resources Corp.	Traverse City, MI
19	Fidelity Oil Co.	Bismarck, ND
86	First Mississippi Corp.	Jackson, MS
128	Flag Redfern Oil Co.	Midland
71	Forest Oil Corp.	Denver
49	Freeport-McMoRan Energy Part.	New Orleans
25	Freeport-McMoRan Inc.	New Orleans
148	Freeport-McMoRan Oil & Gas Royalty Trust	Houston
174	Fuel Resources Development Co.	Denver
164	Fuel Resources Inc.	Staten Island, NY
225	Garnet Resources Corp.	Houston
171	General Energy Development Ltd.	Houston
357	General Energy Resources & Tech. Corp.	Traverse City, MI
220	Geodyne Resources Inc.	Tulsa
282	GeoResources Inc.	Williston, ND
368	Gladstone Resources Inc.	Dallas
44	Global Marine Inc.	Houston
106	Global Natural Resources Inc.	Houston
285	Gold King Consolidated Inc.	Denver
281	Golden Oil Co.	Denver
372	Golden Triangle Royalty & Oil Inc.	Cisco, TX
57	Grace Natural Resources Group	Dallas
271	Graham Income Fund 82A L.P.	Covington, LA
160	Graham-McCormick Oil & Gas Partnership	Covington, LA
309	Great Eastern Energy & Development Corp.	Englewood, CO
308	Greenwood Holdings Inc.	Englewood, CO
97	Hadson Corp.	Oklahoma City
353	Hailey Energy Corp.	Abilene, TX
55	Hamilton Oil Corp.	Denver
335	HarCor Energy Inc.	Beverly Hills, CA
113	Harken Oil & Gas Inc.	Bedford, TX
66	Helmerich & Payne Inc.	Tulsa
217	Hershey Oil Corp.	Pasadena, CA
399	Hipoint Investments Ltd.	Oklahoma City
103	Home Petroleum Corp.	Denver
272	Home-Stake Oil & Gas Co.	Tulsa
240	Home-Stake Royalty Corp.	Tulsa
287	Houston Oil Royalty Trust	Houston
153	Houston Oil Trust	Houston
108	Howell Corp.	Houston
370	Hubco Exploration Inc.	New Orleans
146	Hutton/Energy Assets 3rd Energy Ptrsp. A Ltd.	Houston
205	ICG Petroleum Inc.	Calgary, Alta., Can.
331	Impact Energy Inc.	Fort Worth
130	Integrated Drilling & Exploration Inc.	Tulsa
325	International Basic Resources Inc.	Tucson
369	International Management & Research Corp.	Philadelphia
384	International Royalty & Oil Co.	Fort Worth
342	Intramerican Oil & Minerals Inc.	Dallas
114	Kaneb Energy Partners Ltd.	Richardson, TX
77	Kaneb Services Inc.	Richardson, TX
339	Keldon Oil Co.	San Clemente, CA
289	Kelley Oil Corp.	Houston
170	Kelley Oil & Gas Partners Ltd.	Houston
211	KenCope Energy Cos.	San Antonio
27	Kerr-McGee Corp.	Oklahoma City
238	Kimbark Oil & Gas Co.	Denver
319	Kimco Energy Corp.	Arlington, TX
134	Kirby Exploration Co. Inc.	Houston
316	K.R.M. Petroleum Corp.	White Plains, NY
203	LL&E Royalty Trust	Houston
389	Loch Exploration Inc.	Gainesville, TX
274	Lomak Petroleum Inc.	Hartville, OH
39	Louisiana Land & Exploration Co.	New Orleans
379	Love Oil Co. Inc.	Denver
360	Lyric Energy Inc.	Amarillo
298	Magic Circle Energy Corp.	Oklahoma City
34	Maxus Energy Corp.	Dallas
175	Maynard Oil Co.	Dallas
182	McFarland Energy Inc.	Santa Fe Springs, CA
144	MCO Resources Inc.	Houston
30	Meridian Oil Inc.	Houston
28	Mesa L.P.	Amarillo
236	Michigan Oil Co.	Jackson, MI
391	Minex Resources Inc.	Riverton, WY
31	Mitchell Energy & Development Corp.	The Woodlands, TX
2	Mobil Corp.	New York
311	Monogram Oil & Gas Inc.	North Canton, OH
36	Montana Power Co.	Butte, MT
109	Moore McCormack Energy Inc.	Dallas
366	Morrison Nuclear Inc.	Calgary, Alta., Can.
196	MSR Exploration Ltd.	Cut Bank, MT
32	Murphy Oil Corp.	El Dorado, AR
284	Mustang Cos. Inc.	Great Bend, KS
208	Mustang Resources Corp.	Houston
273	Nahama & Weagant Energy Co.	Bakersfield, CA
84	National Cooperative Refinery Assoc.	McPherson, KS
47	National Fuel Gas Co.	New York
390	National Petroleum Corp. Ltd.	Dallas
123	Nerco Oil & Gas Inc.	Vancouver, WA

The OGJ400 Company Index

Rank by total assets	Company name	Headquarters city
60	Newmont Oil Co.	New York
121	NGC Energy Co.	Concord, CA
33	Nicor Inc.	Naperville, IL
68	Noble Affiliates Inc.	Ardmore, OK
122	Noble Drilling Corp.	Tulsa
99	NOMECO	Jackson, MI
100	Norcen Energy Resources Ltd.	Calgary, Alta., Can.
302	Normandy Oil & Gas Co. Inc.	Fort Worth
347	Nova Natural Resources Corp.	Salt Lake City
332	NP Energy Corp.	Los Angeles
79	NRM Energy Co. L.P.	Dallas
201	Nucorp Energy Inc.	Chicago
250	Nugget Oil Corp.	Bloomington, MN
94	NUI Corp.	Bridgewater, NJ
270	N.Y. Life Oil & Gas Prod. Prop. II-A L.P.	Houston
300	N.Y. Life Oil & Gas Prod. Prop. I-A L.P.	Houston
324	N.Y. Life Oil & Gas Prod. Prop. I-B L.P.	Houston
268	N.Y. Life Oil & Gas Prod. Prop. I-C L.P.	Houston
303	N.Y. Life Oil & Gas Prod. Prop. I-D L.P.	Houston
10	Occidental Petroleum Corp.	Los Angeles
53	Ocean Drilling & Exploration Co.	New Orleans
397	Oil City Petroleum Inc.	Tulsa
168	OKC L.P.	Dallas
286	Omni Exploration Inc.	Columbus, OH
56	Oneok Inc.	Tulsa
172	Oregon Natural Gas Development Corp.	Portland, OR
362	Oxford Consolidated Inc.	Denver
179	Oxoco Inc.	Houston
74	Pacific Enterprises Oil & Gas Co.	Los Angeles
162	PaineWebber Geodyne Energy Income L.P. II-A	Tulsa
187	PaineWebber Geodyne Energy Income L.P. II-B	Tulsa
283	Panhandle Royalty Co.	Oklahoma City
337	Pantepec International Inc.	Woodbridge, CT
313	Parallel Petroleum Corp.	Midland
117	Parker & Parsley Development Partners L.P.	Midland
110	Park-Ohio Industries Inc.	Cleveland
288	Partners Oil Co.	Houston
142	Patrick Petroleum Co.	Jackson, MI
149	Pauley Petroleum Inc.	Los Angeles
90	Pelto Oil Co.	Houston
167	Pend Oreille Oil & Gas Co.	Houston
180	Penn Virginia Resources Corp.	Duffield, VA
24	Pennzoil Co.	Houston
340	Penn-Pacific Corp.	Newport Beach, CA
255	Permian Basin Royalty Trust	Fort Worth
350	Petrol Industries Inc.	Shreveport
200	Petroleum Development Corp.	Bridgeport, WV
213	Petroleum Investments Ltd.	Oklahoma City
296	Petroleum Reserve Corp.	Tulsa
224	Petromark Resources Co.	Tulsa
247	Petrominerals Corp.	Stanton, CA
12	Phillips Petroleum Co.	Bartlesville, OK
295	Pinnacle Petroleum Inc.	The Woodlands, TX
352	Pioneer Oil & Gas Corp.	Midvale, UT
185	Plains Petroleum Co.	Lakewood, CO
135	Plains Resources Inc.	Oklahoma City
345	Plano Petroleum Corp.	Plano, TX
294	Plexus Resources Corp.	Salt Lake City
67	Pogo Producing Co.	Houston
102	Prairie Producing Co.	Houston
239	Premier Resources Ltd.	Denver
116	Presidio Oil Co.	Englewood, CO
291	Prima Energy Corp.	Denver
41	Primark Corp.	McLean, VA
92	Primary Fuels Inc.	Houston
157	Prudential-Bache Energy Income L.P. IIIP-12	Covington, LA
177	Prudential-Bache Energy Income L.P. IIIP-13	Covington, LA
150	Prudential-Bache Energy Income L.P. IIIP-14	Covington, LA
155	Prudential-Bache Energy Income L.P. IIIP-15	Covington, LA
206	Prudential-Bache Energy Income L.P. IIP-10	Covington, LA
216	Prudential-Bache Energy Income L.P. IIP-11	Covington, LA
237	Prudential-Bache Energy Income L.P. IIP-4	Covington, LA
241	Prudential-Bache Energy Income L.P. IIP-5	Covington, LA
244	Prudential-Bache Energy Income L.P. IIP-6	Covington, LA
235	Prudential-Bache Energy Income L.P. IIP-7	Covington, LA
198	Prudential-Bache Energy Income L.P. IIP-8	Covington, LA
222	Prudential-Bache Energy Income L.P. IIP-9	Covington, LA
129	Prudential-Bache Energy Income L.P. IVP-16	Covington, LA
125	Prudential-Bache Energy Income L.P. IVP-17	Covington, LA
137	Prudential-Bache Energy Income L.P. VP-18	Covington, LA
126	Prudential-Bache Energy Income L.P. VP-19	Covington, LA
279	Pyramid Oil Co.	Bakersfield, CA
105	Pyro Energy Corp.	Evansville, IN
266	QED Exploration Inc.	Denver
231	Quadra Oil & Gas Inc.	Denver
64	Quaker State Corp.	Oil City, PA
329	Questa Oil & Gas Co.	Littleton, CO
51	Questar Corp.	Salt Lake City
93	Quinoco Cos.	Denver
83	Ram Industries Inc.	Dallas
317	Ranger Oil Ltd.	Calgary, Alta., Can.
269	Ratex Resources Inc.	Oklahoma City
61	Reading & Bates Corp.	Tulsa
232	Red Eagle Resources Corp.	Oklahoma City
383	REO Production I-A L.P.	Oklahoma City
290	Republic Resources Corp.	Oklahoma City
374	Reserve Exploration Co.	Tulsa
223	Resource Exploration Inc.	Akron, OH
348	Roberts Oil & Gas Inc.	Houston
346	Roseland Oil & Gas Inc.	Tyler, TX
400	Rotan Mosle Energy Fund III Ltd.	Houston
89	Sabine Corp.	Dallas
226	Sabine Royalty Trust	Dallas
249	Sage Drilling Co. Inc.	Wichita
118	Sage Energy Co.	San Antonio
176	Samson Energy Co.	Tulsa
124	San Juan Basin Royalty Trust	Fort Worth
50	Santa Fe Energy Co.	Houston
78	Santa Fe Energy Partners L.P.	Houston
188	Saxon Oil Co.	Dallas
194	Saxon Oil Development Partners L.P.	Dallas
88	Seagull Energy Corp.	Houston
251	Seahawk Oil International Inc.	Newport Beach, CA
277	Search Natural Resources Inc.	Dallas
318	Senergy 1986 Ltd.	Houston
375	Sharon Energy Ltd.	Englewood, CO
371	Sheffield Exploration Co. Inc.	Denver
5	Shell Oil Co.	Houston
104	Snyder Oil Partners L.P.	Fort Worth
26	Sonat Inc.	Birmingham, AL
320	Southern Mineral Corp.	Houston
81	Southern Union Co.	Dallas
91	Southwestern Energy Co.	Fayetteville, AR
107	Statex Petroleum Inc.	San Diego
301	Strata Corp.	Columbus, OH
278	Striker Petroleum Corp.	Englewood, CO
356	Struthers Oil & Gas Corp.	Tulsa
257	Summit Energy Inc.	Dallas
349	Summit Petroleum Corp.	Abilene, TX
11	Sun Co.	Radnor, PA
76	Sunshine Mining Co.	Dallas
209	Swift Energy Co.	Houston
210	Taurus Exploration Inc.	Birmingham, AL
344	Taurus Petroleum Inc.	Denver
9	Tenneco Inc.	Houston
65	Tesoro Petroleum Corp.	San Antonio
4	Texaco Inc.	White Plains, NY
143	Texas American Energy Corp.	Far Hills, NJ
159	Texas International Co.	Oklahoma City
386	Texas Vanguard Oil Co.	Austin, TX
392	Texoil Inc.	Jacksboro, TX
234	Texon Energy Corp.	Houston
95	TGX Corp.	Houston
158	Thermal Exploration Co.	Seattle
253	Thor Energy Resources Inc.	Tyler, TX
75	Tidewater Inc.	New Orleans
186	Tipperary Corp.	Midland
378	Toklan Oil Corp.	Tulsa
136	Tom Brown Inc.	Midland
85	Total Minatome Corp.	Houston
52	Total Petroleum (North America) Ltd.	Denver
381	TPEX Exploration Inc.	Denver
20	Transco Energy Co.	Houston
48	Transco Exploration Partners Ltd.	Houston
256	Trinity Resources Ltd.	Houston
70	Triton Energy Corp.	Dallas
394	Tri-Valley Corp.	Bakersfield, CA
218	Tucker Drilling Co. Inc.	San Angelo, TX
355	Twin Richfield Oils Inc.	Calgary, Alta., Can.
321	Tyrex Oil Co.	Casper, WY
63	Unimar Co.	Tarrytown, NY
40	Union Exploration Partners Ltd.	Los Angeles
35	Union Pacific Resources Co.	Fort Worth
38	Union Texas Petroleum Holdings Inc.	Houston
152	Unit Corp.	Tulsa
14	Unocal Corp.	Los Angeles
305	Usenco Inc.	Fort Worth
13	USX (Oil & Gas Segment)	Pittsburgh
328	Valex Petroleum Inc.	Fort Worth
243	Vermilion Bay Land Co.	Lafayette, LA
112	Wainoco Oil Corp.	Houston
192	Walker Energy Partners	Houston
314	Wepco Energy Co.	Denver
262	Western Energy Development Co. Inc.	Denver
336	Western Energy Resources Inc.	Mission Viejo, CA
312	Wexco of Delaware Inc.	Milwaukee
280	Whiting Petroleum Corp.	Denver
252	Wichita River Oil Co.	Denver
382	Wicklund Holding Co.	Bloomfield Hills, MI
363	Willard Pease Oil & Gas Co.	Grand Junction, CO
161	Wilshire Oil Co. of Texas	Jersey City, NJ
395	Winco Petroleum Corp.	Denver
120	Wiser Oil Co.	Sistersville, WV
166	Wolverine Exploration Co.	Fort Worth
306	Woodbine Petroleum Inc.	Dallas
326	Wright Brothers Energy Inc.	San Antonio
263	Xplor Corp.	New York
398	Yellowstone Resources Inc.	Denver
59	Zapata Corp.	Houston
260	ZG Energy Corp.	Tulsa

International Active Rig Count

Region	1981	1982	1983	1984	1985	1986 Land	1986 Off.	1986 Total	1987 Land	1987 Off.	1987 Total	1988 Land	1988 Off.	1988 Total
NORTH AMERICA														
Canada	263	200	201	259	311	174	4	178	179	2	181	194	2	196
United States*	3,969	3,117	2,229	2,429	1,976	847	123	970	816	120	936	784	152	936
Subtotal	**4,232**	**3,317**	**2,430**	**2,688**	**2,287**	**1,021**	**127**	**1,148**	**995**	**122**	**1,117**	**978**	**154**	**1,132**
LATIN AMERICA														
Argentina	70	67	73	82	81	47	0	47	60	1	61	63	0	63
Bolivia	11	11	8	6	5	4	0	4	6	0	6	5	0	5
Brazil	81	94	83	70	76	46	31	77	35	25	60	28	11	39
Chile	7	7	6	6	6	3	3	6	4	3	7	2	3	5
Colombia	22	23	18	16	21	17	0	17	14	0	14	19	0	19
Costa Rica	0	0	1	1	0	0	0	0	1	0	1	0	0	0
Ecuador	4	6	5	4	2	3	0	3	3	0	3	5	1	6
Mexico	218	202	187	196	196	132	31	163	112	31	143	121	34	155
Peru	24	23	16	17	12	9	4	13	11	4	15	6	5	11
Trinidad	14	13	10	9	10	7	4	11	5	4	9	3	4	7
Venezuela	63	69	41	30	33	16	13	29	9	9	18	15	10	25
Other	7	7	3	2	1	1	0	1	1	0	1	0	0	0
Subtotal	**521**	**522**	**451**	**439**	**443**	**285**	**86**	**371**	**261**	**77**	**338**	**267**	**68**	**335**
FAR EAST														
Australia	23	33	25	34	31	9	6	15	13	3	16	14	5	19
Bangladesh	5	5	2	4	5	5	0	5	5	0	5	2	0	2
Brunei	7	10	10	9	7	1	4	5	0	3	3	1	3	4
Burma	30	32	36	33	33	32	1	33	29	0	29	26	0	26
China-offshore	9	10	10	9	14	0	7	7	0	4	4	0	8	8
India	44	50	56	57	62	55	15	70	94	22	116	102	25	127
Indonesia	86	92	88	82	80	42	20	62	25	12	37	33	11	44
Japan	16	22	20	18	16	12	3	15	10	0	10	11	0	11
Malaysia	12	13	10	9	8	0	8	8	0	8	8	0	9	9
New Zealand	3	1	2	2	4	3	1	4	2	1	3	1	1	2
Pakistan	15	17	17	17	18	17	0	17	14	0	14	13	0	13
Papua New Guinea	0	0	1	1	2	1	0	1	2	0	2	3	0	3
Philippines	13	14	8	3	2	1	0	1	2	0	2	3	1	4
Taiwan	11	4	5	6	7	5	2	7	2	2	4	2	2	4
Thailand	7	8	13	11	9	3	1	4	3	3	6	3	3	6
Other	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Subtotal	**281**	**311**	**303**	**295**	**298**	**186**	**68**	**254**	**201**	**58**	**259**	**214**	**69**	**283**
AFRICA														
Algeria	91	81	54	27	35	41	0	41	40	0	40	32	0	32
Angola	5	11	12	7	11	0	7	7	1	9	10	0	10	10
Congo	7	6	4	3	3	0	2	2	0	3	3	0	2	2
Gabon	13	12	7	6	7	1	2	3	0	3	3	3	2	5
Kenya	0	0	0	0	0	0	0	0	1	0	1	1	0	1
Libya	33	31	24	26	30	20	0	20	12	0	12	14	2	16
Nigeria	23	27	17	11	10	7	3	10	6	5	11	7	6	13
South Africa	2	2	2	2	3	0	3	3	0	3	3	0	4	4
Tunisia	11	11	7	6	4	2	1	3	3	1	4	2	1	3
Other	28	27	20	17	15	7	1	8	3	0	3	3	2	5
Subtotal	**213**	**208**	**147**	**105**	**118**	**78**	**19**	**97**	**66**	**24**	**90**	**62**	**29**	**91**
EUROPE														
Austria	9	9	9	7	7	6	0	6	4	0	4	4	0	4
Denmark	2	2	5	3	4	0	3	3	0	3	3	0	2	2
France	21	22	17	20	22	15	0	15	8	0	8	8	0	8
Germany, Fed. Rep.	26	31	25	19	20	19	0	19	12	0	12	9	0	9
Greece	6	5	3	4	1	0	0	0	2	0	2	2	0	2
Holland	17	21	17	18	24	4	11	15	3	7	10	4	10	14

International active rig count—continued

Region	1981	1982	1983	1984	1985	1986 Land	1986 Off.	1986 Total	1987 Land	1987 Off.	1987 Total	1988 Land	1988 Off.	1988 Total
Italy	32	38	26	26	40	24	9	33	20	6	26	17	7	24
Norway	12	13	10	10	13	0	12	12	0	12	12	0	15	15
Spain	11	12	8	9	10	4	3	7	2	0	2	1	1	2
United Kingdom	58	58	42	60	63	7	36	43	4	40	44	5	52	57
Yugoslavia	22	24	21	25	27	27	3	30	28	3	31	28	3	31
Other	2	2	2	2	2	0	1	1	0	1	1	0	1	1
Subtotal	**218**	**237**	**185**	**203**	**233**	**106**	**78**	**184**	**83**	**72**	**155**	**78**	**91**	**169**
MIDDLE EAST														
Abu Dhabi	31	41	35	29	21	8	7	15	3	6	9	2	5	7
Dubai	2	3	7	7	5	1	2	3	0	2	2	0	3	3
Egypt	27	36	35	36	37	17	16	33	14	9	23	11	10	21
Iran	0	3	13	20	20	16	2	18	18	0	18	18	0	18
Iraq	14	11	23	19	28	21	0	21	10	0	10	23	0	23
Jordan	0	0	3	3	2	2	0	2	2	0	2	2	0	2
Kuwait	3	4	5	5	6	6	0	6	6	0	6	6	0	6
North Yemen	0	0	0	0	1	4	0	4	4	0	4	3	0	3
Oman	10	12	11	12	13	12	1	13	10	0	10	9	0	9
Qatar	7	5	3	2	3	1	0	1	1	0	1	2	1	3
Saudi Arabia	29	29	26	16	11	5	1	6	4	1	5	3	1	4
Syria	16	15	15	23	26	27	0	27	22	0	22	24	0	24
Turkey	26	34	26	24	25	27	0	27	26	0	26	20	1	21
Other	5	7	4	1	3	2	0	2	1	0	1	0	0	0
Subtotal	**170**	**200**	**206**	**197**	**201**	**149**	**29**	**178**	**121**	**18**	**139**	**123**	**21**	**144**
Total	**5,635**	**4,795**	**3,722**	**3,927**	**3,580**	**1,825**	**407**	**2,232**	**1,727**	**371**	**2,098**	**1,722**	**432**	**2,154**

* U.S. offshore includes inland water rigs: 23 in 1986, 24 in 1987, 30 in 1988. Source: Baker Hughes Inc.

International seismic crew count

	1983 Land	1983 Marine	1983 Total	1984 Land	1984 Marine	1984 Total	1985 Land	1985 Marine	1985 Total
	(Average crews operating)								
United States	430	49	479	441	47	488	319	45	364
Canada	72	7	79	82	5	87	86	4	90
Mexico	28	1	29	32	0	32	32	0	32
Central & South America	81	5	86	79	9	88	64	8	72
Europe	71	26	97	81	35	116	78	35	113
Middle East	33	1	34	36	2	38	40	2	42
Africa	60	10	70	53	6	59	55	6	61
Far East	95	15	110	85	12	97	92	9	101
Total	**870**	**114**	**984**	**889**	**116**	**1,005**	**766**	**109**	**875**

	1986 Land	1986 Marine	1986 Total	1987 Land	1987 Marine	1987 Total	1988* Land	1988* Marine	1988* Total
	(Average crews operating)								
United States	161	22	183	154	24	178	162	30	192
Canada	53	1	54	58	1	59	78	0	78
Mexico	29	0	29	23	0	23	21	0	21
Central & South America	48	5	53	46	5	51	55	4	59
Europe	65	26	91	52	25	77	49	25	74
Middle East	33	4	37	35	3	38	41	2	43
Africa	44	4	48	37	5	42	35	7	42
Far East	74	9	83	87	9	96	90	11	101
Total	**507**	**71**	**578**	**492**	**72**	**564**	**531**	**79**	**610**

*First half.
Source: Society of Exploration Geophysicists

Table 1

How OPEC members have boosted refining capacity

	Refining capacity (access)* 1,000 b/d			Percent change	Oil production 1,000 b/d			Percent change
	1983	1985	1987	1983-87	1983	1985	1987	1983-87
Algeria	471.2	471.2	471.2	—	685.0	647.1	652.4	−4.8
Ecuador	94.6	94.6	94.6	—	233.0	275.7	173.9	−25.4
Gabon	44.0	44.0	21.0	−52.3	148.3	152.5	157.3	+6.1
Indonesia	473.4	837.0	837.0	+76.8	1,301.1	1,242.3	1,185.8	−8.9
Iran	670.0	615.0	615.0	−8.2	2,466.7	2,241.7	2,309.2	−6.4
Iraq	215.5	365.5	365.5	+69.6	883.3	1,447.5	2,135.0	+141.7
Kuwait	594.0	614.0	720.0	+21.2	887.5	862.5	1,120.8	+26.3
Access	—	132.5	132.5	—	—	—	—	—
Libya	117.0	315.0	342.0	+192.3	1,018.3	1,047.5	1,093.8	+7.4
Access	105.0	105.0	105.0	—	—	—	—	—
Neutral Zone	—	—	—	—	391.2	352.5	387.1	−1.0
Nigeria	234.0	234.0	243.0	+3.8	1,233.8	1,481.7	1,254.5	+1.7
Access†	—	—	(156)	—	—	—	—	—
Qatar	13.0	63.0	63.0	+384.6	294.4	298.8	280.3	−4.8
Saudi Arabia	765.0	1,190.0	1,490.0	+94.8	4,850.0	3,283.3	4,025.0	−17.0
Access	—	—	(886)	—	—	—	—	—
United Arab Emirates	121.5	162.0	162.0	+33.3	1,109.2	1,141.7	1,399.6	+26.2
Access	—	—	346.0	—	—	—	—	—
Venezuela	1,323.1	1,224.2	1,224.2	−7.5	1,775.8	1,645.8	1,580.8	−11.0
Access	294.0	614.0	1,354.9	+360.8	—	—	—	—
Subtotal	**5,136.3**	**6,229.5**	**6,648.5**	**+29.4**	—	—	—	—
Access subtotal	**399.0**	**851.5**	**1,938.4**	**+385.8**	—	—	—	—
Total	**5,535.3**	**7,081.0**	**8,586.9**	**+55.1**	**17,277.6**	**16,120.6**	**17,755.5**	**+2.8**

*Generally, access to refinery capacity outside country; refers to total capacity of outside refineries, even if equity interest or crude supply deal represents only a portion of total capacity. †Hypothetical, not included in total. Represents Nigeria National Petroleum Co. overtures for Sun Oil Co. refining assets in U.S. and Bantry Bay refinery in Ireland.

tions because they:

- Eliminate incentives to build new grassroots refineries.
- Teach OPEC members about end-use products markets, thereby making them much more reasonable sellers of crude.
- Rein OPEC member incentives to cut supplies.
- Force OPEC to keep official prices in line with the market—"antiquated" government selling prices will slowly disappear.
- Improve rationalization of the refining industry.

Or market bane?

Although diversification will pay short term dividends for OPEC members, in the long term, said Verleger, "exporting countries will conclude that their success or failure in the joint control over the level of output will be the primary determinant of their economic well being. It is in this area that downstream integration poses the greatest threat."

Verleger thinks that the acquisition of downstream assets by the major crude exporting nations will reduce their ability to coerce cooperation from smaller exporters because the big ones will lack their traditional diversified marketing channels.

If a crude exporter becomes fully integrated, then the traditional multinational buyers of that country's exports will be forced to find other sources of supply, he contends.

Should that fully integrated crude exporter then decide to confront increased output by smaller OPEC and non-OPEC nations by boosting production, it would find that its former buyers have turned to other suppliers and are no longer willing to take oil from them, Verleger said.

"Over time, we expect that smaller exporting countries will realize that the larger exporting nations have lost much of their former flexibility by developing integrated systems.

"The nonintegrated producers will use this loss of flexibility to their advantage by making term arrangements with both integrated and nonintegrated companies that are now owned by producing nations."

In that event, production quotas will then become essentially meaningless to the smaller exporters, Verleger said.

"Since flexibility, particularly to adjust output, was required to make the cartel work and to hold prices at official levels, the move downstream seems sure to undercut efforts to hold oil prices above the marginal cost of production."

OPEC demise omen?

That scenario points to other analysts' contention that the push downstream is an omen of OPEC's coming demise.

John Roberts, Middle East Institute senior adviser, said, "As the trend toward downstream integration intensifies, the principal division among oil producers is likely to move from that between OPEC and non-OPEC to the distinction between countries with integrated oil industries and secure outlets for their crude and products and those that lack such a structure and facilities."

He sees principal divisions being headed by Saudi Arabia and Kuwait in the integrated group and Iran and Iraq in the nonintegrated group.

Without access to products markets to unload surplus crude, nonintegrated producers will become marginal producers. That likely will make crude prices more volatile as more producers compete to cover what should be a relatively narrow gap between world demand and supply available from nonintegrated sources, Roberts wrote in a monograph by the University of Colorado's International Research Center for Energy and Economic Development.

"The effect will be to push prices sharply downward at times of excess output."

Verleger said that OPEC's push downstream intensifies the problem of overproduction.

"The oil exporting nations will undoubtedly be disappointed with their foray into downstream activities. In the long run, their actions will probably depress, not increase, their incomes."

Table 1

Breakout of tanker demand forecast

VESSELS AND TRAFFIC Vessel size 1,000 dwt	1986	1990	1995	2000
	Billion metric ton-miles/year			
<60	1,228	1,280	1,443	1,671
60-100	931	1,098	1,224	1,379
100-200	1,227	1,387	1,521	1,671
200-300	1,650	2,036	2,229	2,506
>300	424	571	644	744
Total	**5,460**	**6,372**	**7,061**	**7,971**
SEABORNE TRADE VOLUME*				
	1986	**1990**	**1995**	**2000**
	Million metric tons			
Exports				
Middle East	521	586	704	784
Central/S. America	183	222	231	246
Imports				
North America	343	350	418	406
Western Europe	443	421	432	440
Total	**1,263**	**1,343**	**1,489**	**1,584**

*Crude and products.

Source: Ocean Shipping Consultants

Table 2

Drewry's oil market/tanker outlook

	1987	1988 Case 1	1988 Case 2	1992 Case 1	1992 Case 2
Average crude oil price (Saudi light-1986 $/bbl)	17.12	17.72	14.50	20.12	14.50
	Billion metric tons/year				
World oil product consumption	1.888	1.936	2.049	1.946	2.142
World refinery throughput	1.901	1.923	1.933	2.044	2.116
Non-Communist oil production					
OPEC	0.928	0.897	0.917	1.049	1.175
Non-OPEC	1.226	1.239	1.250	1.189	1.239
Total	2.154	2.136	2.167	2.238	2.414
OPEC share (%)	43	42	42	47	49
Seaborne crude oil movements	1.156	1.135	1.151	1.240	1.359
Export zones					
Middle East	0.454	0.426	0.436	0.509	0.575
Eastern Mediterranean	0.107	0.132	0.133	0.131	0.143
North Africa	0.094	0.074	0.079	0.068	0.101
West Africa	0.087	0.084	0.085	0.098	0.109
Caribbean	0.132	0.118	0.117	0.146	0.146
Import zones					
North America	0.277	0.271	0.285	0.321	0.388
Europe	0.378	0.375	0.371	0.396	0.421
Pacific	0.163	0.162	0.159	0.167	0.171
	Million dwt				
Crude oil tanker employment	167.3	154.9	157.9	174.6	195.7
VLCC/ULCC	90.0	79.5	81.0	93.2	106.1

Source: Drewry Shipping Consultants Ltd.

Table 3

Breakout of 1987 shipments

	Imports		Exports	
	Crude	Products	Crude	Products
	1,000 b/d			
U.S.	4,625	1,620	150	595
Canada	270	75	625	5
Latin America	585	415	2,080	955
Western Europe	6,104	1,765	550	505
Middle East	80	35	8,640	1,675
North Africa	10	55	1,940	495
West Africa	10	30	1,810	70
East, southern Africa	395	45	—	5
South Asia	425	65	—	55
Southeast Asia	1,545	475	970	385
Japan	3,200	925	—	30
Australasia	125	95	85	55
U.S.S.R., eastern Europe, China*	790	105	1,750	1,160
Destination unknown†	400	285	—	—
Total	**18,600**	**5,990**	**18,600**	**5,990**

*Excludes intraregional trade within the Communist bloc. †Includes changes in the volume of oil in transit, transit losses, minor movements not otherwise shown, unidentified military use, etc.

Source: British Petroleum Co. plc

throughput is likely to follow suit.

Europe's small exports of crude will fall further with declining oil production, even more sharply under a low price scenario in which plans to develop marginal fields are abandoned.

Drewry said U.S. crude imports will continue to rise without further significant discoveries or price rises to boost marginally economic reserves. European imports will follow the same track.

Crude imports in Japan, Australia, and South/Southeast Asia will remain flat, mostly because there will be little change in refinery throughputs.

South America will be a mixed bag, as countries with sharply rising production like Brazil slash crude imports and countries with sharply rising demand and flat production hike crude imports.

Stable capacity seen for tanker fleet

Overseas Shipholding said at the beginning of second quarter 1988 the non-Communist tanker fleet size would remain "more or less constant" if 1988 scrappings matched 1987 levels.

At yearend 1987, the newbuilding tanker backlog for the next several years totaled 21 million dwt, compared with 15 million dwt at yearend 1986. Deliveries scheduled for 1988 total about 8 million dwt, about equal to 1987's scrapping total (Fig. 1).

Deliveries in 1987 totaled about 5 million dwt.

The share of total capacity carrying oil was shrinking. Attracted by higher freight rates, many combined carriers—vessels capable of carrying liquid or dry bulk cargoes—shifted to dry bulk.

The combined carrier fleet totaled about 34 million dwt at yearend 1987, about constant with 1986, but the portion active in oil trade fell from about 64% at the beginning of the year to 35% at yearend.

Combined with the decline in tanker capacity, the shift of combined carriers to dry bulk trade reduced the capacity of the oil carrying fleet by 13 million dwt.

Demand for oil carrying tonnage, measured as total tonnage employed, declined in 1987—but less than supply.

Employment of tankers, excluding combined carriers, increased 5 million dwt.

Laid up tanker tonnage fell to 10 million dwt at yearend 1987—the lowest level in 7 years—from 14 million dwt in 1986 and 36 million dwt in 1985.

An additional increase of 5 million dwt in tanker employment resulted from efficiency measures such as less slow

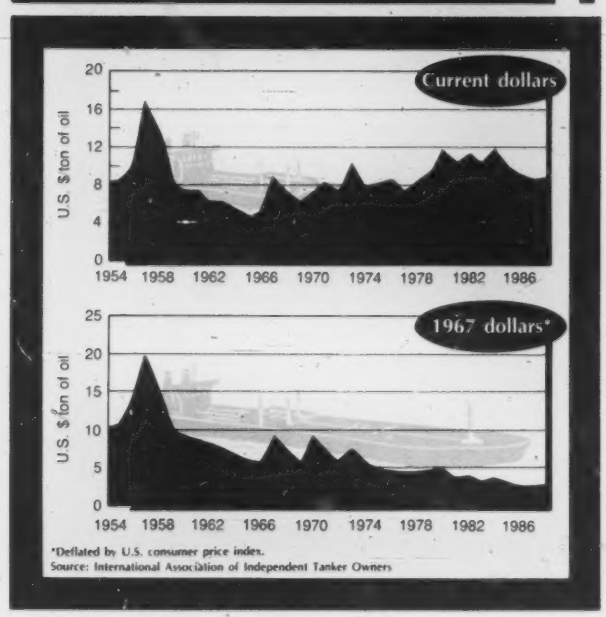
Table 4

Eleven years of world oil trade

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	% change 1986-87	1987 % of total
IMPORTS						1,000 b/d							
U.S.	8,710	8,225	8,410	6,735	5,950	5,040	4,990	5,380	5,065	6,045	6,245	+ 3.3	25.4
Western Europe	13,295	13,090	13,080	11,825	10,245	9,350	8,665	8,595	8,365	8,860	7,905	−10.8	32.1
Japan	5,510	5,335	5,605	4,985	4,460	4,155	4,145	4,305	4,045	4,140	4,125	− 0.4	16.8
Rest of world	7,240	7,400	8,255	8,390	8,000	7,020	6,555	6,470	6,645	7,220	6,315	−12.5	25.7
Total	**34,755**	**34,050**	**35,350**	**31,935**	**28,655**	**25,565**	**24,355**	**24,750**	**24,120**	**26,265**	**24,590**	**− 6.4**	**100.0**
EXPORTS													
U.S.	250	365	485	555	605	815	740	720	780	765	745	− 2.6	3.0
Canada	540	445	455	445	455	485	545	655	685	675	630	− 6.7	2.6
Latin America	3,115	3,400	3,645	3,885	4,380	4,135	4,065	4,100	3,565	3,600	3,035	−15.7	12.3
Middle East	20,730	19,730	20,435	17,510	14,605	11,660	10,355	9,845	9,340	10,880	10,315	− 5.2	41.9
North Africa	3,295	3,370	3,425	2,820	2,175	2,145	2,180	2,290	2,415	2,515	2,435	− 3.2	9.9
West Africa	2,370	2,115	2,645	2,475	1,730	1,500	1,425	1,670	1,765	1,980	1,880	− 5.1	7.6
Southeast Asia	1,915	1,790	1,915	1,705	1,660	1,480	1,400	1,600	1,555	1,550	1,355	−12.6	5.5
U.S.S.R., E. Europe, China	1,975	2,200	1,740	2,005	2,195	2,245	2,655	2,865	2,920	3,020	2,910	− 3.6	11.8
Rest of world	565	635	605	535	850	1,100	990	1,005	1,095	1,280	1,285	+ 0.4	5.4
Total	**34,755**	**34,050**	**35,350**	**31,935**	**28,655**	**25,565**	**24,355**	**24,750**	**24,120**	**26,265**	**24,590**	**− 6.4**	**100.0**

Source: British Petroleum Co. plc

Persian Gulf-Europe freight rates 4



steaming.

But the shift to dry bulk by combined carriers was enough to offset those employment gains for a small demand decline on balance.

VLCCs, ships of 175,000 dwt and larger, made up most of the capacity surplus, which Overseas Shipholding estimated at 26% of the fleet at yearend 1987, compared with 29% a year earlier.

Most of the surplus was in slow steaming, tankers used for storage, and idle time between voyages.

The share of total surplus capacity in layup was shrinking, and more than 90% of the laid-up tonnage involved VLCCs and ULCCs (Fig. 2).

"Because of their age and condition, it is likely that many of these vessels will never resume trading," Overseas Shipholding said. Seaborne trade in crude oil and petroleum products totaled about 1.3 billion dwt in 1987, the same as in 1986.

Start-up of Iraq's 500,000 b/d crude oil pipeline to Ceyhan, Turkey, on the Mediterranean Sea moderated average voyage distances, Overseas Shipholding said. Offsetting that were minor changes in the proportion of oil moving by sea and shifts in geographic distribution of production and consumption.

Biggest exporters, biggest importer

British Petroleum Co. plc figures highlight the dominant role of the Middle East in world shipments of oil by tankers (Fig. 3).

The Middle East also has long dominated oil exports by tanker and pipeline, accounting for 42% of world exports in 1987. The U.S. is easily the world's biggest oil importer, with incoming cargoes heavily weighted toward crude oil shipments.

BP data show that total oil exports slipped 6.4% in 1987 after a big runup in 1986 as a result of plunging oil prices. The runup was due in large part to a netback pricing system used by large exporters.

And although oil prices have bounced around during the years, freight rates in constant dollars have declined since the mid-1970s (Fig. 4).

That's because competition in the tanker trade led to more efficient vessels, particularly through economies of scale, said the International Association of Independent Tanker Owners (Intertanko), Oslo.

An Intertanko report in September 1988 showed that the average current dollar freight rate from the Middle East to western Europe was $8.20/ton in 1954.

The corresponding figure during first half 1988 was $8.75/ton.

"In other words," Intertanko said, "the freight rate is still nearly the same as it was 34 years ago. And this has happened at a time when high inflation has been one of the most serious problems."

In constant 1967 dollars, deflated by the U.S. consumer price index, the Persian Gulf-western Europe freight cost in 1954 was $10.25/ton. That fell to $2.51/ton in first half 1988.

Single point mooring around the world

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
Angola	1968	Cabinda	Gulf	SBM	100,000	2-16"/CALM	77
	1979	Quinfuquena	Petrangol	EMH	150,000	2-16"	NA
	1980	Essungo	Texaco/Petrangol	IMODCO	250,000	2-24" & 1-16"/CALM	115
	1980	Cabinda	Gulf	SBM	55,000	1-4"/CALM	118
	1982	Takula	Gulf	SBM	300,000	1-12"/CALM	200
	1985	Takula II	Gulf	SBM	319,000	CALM	72
	1984	Palanca	Elf	SBM	265,000	S-Y CALM	148
Argentina	1970	Puerto Rosales	YPF	IMODCO	40,000	1-16" & 1-12"/CALM	59
	1975	Caleta Olivia	YPF	IMODCO	60,000	1-20" & 1-12"/CALM	113
	1979	Caleta Cordova	YPF	IMODCO	60,000	1-20" & 1-12"/CALM	89
	1980	Puerto Rosales	YPF	IMODCO	60,000	1-20" & 1-12"/CALM	NA
	1987	Hidra	Total	SBM	N/A	CALM	N/A
Australia	1970	Botany Bay	Maritime Services	SBM	120,000	3-12"/CALM	63
	1985	Jabiru	BHP	SBM	160,000	Turret/FPS	394
Bangladesh	1967	Chittagong	Chittagong Port Trust	IMODCO	45,000	1-12"/CALM	45
Brazil	1968	Tramandai	Petrobras	SMB	105,000	2-16"/CALM	71
	1970	Tramandai	Petrobras	SBM	200,000	1-24"/CALM	71
	1975	Garoupa	Perobras	CB & 1	53,000	NA	NA
	1975	Garoupa	Petrobras	CB & 1	53,000	NA	NA
	1976	Sao Francisco	Petrobras	IMODCO	200,000	2-20"/CALM	72
	1978	Garoupa	Petrobras	IMODCO	53,000	2-16"/CALM	410
	1978	Enchova 4	Petrobras	SBM	53,000	1-8"/CALM	410
	1979	Tedut & Tefran	CEC/Petrobras	SBM	200,000	2-20"/CALM	72
	1980	Arembepe	Tibras	SBM	4,000	1-16"/CALM	60
	1981	Pampo	Petrobras	SBM	53,00	1-16"/CALM	460
	1981	RJS 28A	Petrobras	SBM	53,000	1-16"/CALM	395
	1981	Badejo	Petrobras	IMODCO	53,000	2-10"/CALM	338
	1982	Corvina	Petrobras	SBM	53,000	2-8"/CALM	492
	1982	Garoupa	Petrobras	Bluewater	100,000	S-Y CALM	
	1986	Albacora	Petrobras	SBM	55,000	SBS	754
Brunei	1971	Seria	Shell	SBM	150,000	2-16"/CALM	73
	1975	Seria	Shell	SBM	210,000	2-20"/CALM	67
	1981	Seria	Shell	Mitsubishi	313,000	1-20" & 1-16"/CALM	NA
Cameroon	1976	Kole	Elf Serepca	IMODCO	150,000	1-12"/CALM	80
	1979	Kole	Elf Serepca	Bluewater	250,000	1-24"/CALM	102
	1979	Limboth Point	Sonara	SBM	150,000	2-16" & 1-16"/CALM	75
	1981	Kole	Elf Serepca	IMODCO	250,000	2-24" & 1-16"/CALM	85
	1982	Victoria Marine	Total	EMH	280,000	CALM	183
Canada	1969	St. John, N.B.	Irving Oil	SBM	350,000	1-24" & 1-16"/CALM	149
	1987	Saint John	Canaport	SBM	N/A	CALM	N/A
Chile	1971	Quintero Bay	Enap	SBM	209,000	2-20"/CALM	154
China	1985	Weitzhou	Total	EMH	250,000	Fix tower	123
	1985	Bohai Bay	JCODC	Bluewater	100,000	FPSO/TOWSY	72
	1985	Weitzhou	CSOFL	SBM	250,000	Tank Conv.	250
	1988	Block 16/08 S. China Sea	ACT	SBM	250,000	Turret-disc	380
	1988	BZ-34-2 Bohai	JCODC	SBM	52,000	SY-Jacket	65
	1986	BZ-28-1, Bohai	JCODC	SBM	52,000	SY-Jacket	75
Colombia	1985	Covenas	Occidental	Bluewater	120,000	CALM	80
	1985	Covenas	Occidental	Bluewater	350,000	CALM S-Y	110

Single point mooring around the world—*continued*

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
Congo	1972	Djeno	Elf Congo	SBM	250,000	2-20"/CALM	75
Denmark	1971	Dan	Danbor	SBM	70,000	1-12"/CALM	150
	1979	Gorm	Danbor	SBM	70,000	2-12"/CALM	128
	1982	Frederickshaven	DDCS	SOFEC	35,000	2-20"/CALM	50
Dominican Republic	1971	Santo Domingo	Refineria Domincia	SBM	150,000	2-16"/CALM	85
Ecuador	1971	Esmeraldas	Gulf/Texaco	SBM	100,000	2-20"/CALM	124
	1971	Esmeraldas	Gulf/Texaco	SBM	100,000	1-24" & 1-20"/CALM	124
	1978	Esmeraldas	Texaco	IMODCO	100,000	1-24" & 1-20"/CALM	118
Equatorial Guinea	1963	Bata	CEPSA	IMODCO	20,000	1-16"/CALM	39
Egypt	1968	Ras-el-Shaqiq	Wepco	SBM	100,000	2-16"/CALM	78
	1974	Suez	Sumed	SBM	120,000	2-20"/CALM	82
	1974	Alexandria	Sumed	SBM	120,000	2-20" & 1-16"/CALM	85
	1974	Alexandria	Sumed	SBM	120,000	2-20" & 1-16"/CALM	82
	1974	Alexandria	Sumed	SBM	120,000	2-20" & 1-16"/CALM	82
	1976	Suez	Sumed	IMODCO	250,000	2-24"/CALM	80
	1976	Alexandria	Sumed	IMODCO	250,000	2-24" & 1-20"/CALM	108
	1976	Alexandria	Sumed	IMODCO	250,000	2-24" & 1-20"/CALM	108
	1976	Aganti	EGPA	SBM	100,000	2-16"/CALM	98
	1978	El Alamein	Wepco	SBM	100,000	2-16"/CALM	70
	1980	Ras Budran	Suez Oil Co.	SBM	250,000	1-24" & 1-20"/CALM	115
	1981	Suez	Sumed	SBM	500,000	2-24" & 1-16"/CALM	118
	1982	Sidi Kerir	Sumed	IMODCO	250,000	2-20" & 1-20"/CALM	108
	1983	Zeit Bay	SUCO	SBM	155,000	2-20"/CALM	82
	1983	Ras Shukeir	EGPC	SBM	100,000	CBM	
	1983	Wadi Feiran	Petrojet	NA	100,000	NA	
	1984	East Zeit Bay	Esso	IMODCO	85,000	CALM	200
	1984	Geisum	Conoco	IMODCO	100,000	ENG FPSO	
	1985	Sadat area	Petrojet	IMODCO	60,000	CBM	60
Falklands	1984	Port	M.O.D.	IMODCO	45,000	1-10" CALM	65
France	1968	Bay of Biscay	Elf	CFEM	100,000	NA	NA
	1973	Frontignan	Mobil	IMODCO	270,000	2-20"/CALM	102
Gabon	1965	Gamba	Shell	SBM	100,000	1-16"/CALM	63
	1967	Lucina	Shell	SBM	165,000	1-16"/CALM	112
	1979	Gamba	Shell	SBM	140,000	1-16" & 1-10"/CALM	63
	1983	Inguessi	AMOCO	Bluewater	—		
	1980	Mayumba	Elf Gabon	Bluewater	70,000	1-4"/CALM	79
Ghana	1978	Bonsu	Agripetco	SOFEC	64,000	1-10"/CALM	79
India	1975	Bombay High	ONGC	SBM	100,000	1-16" & 1-8"/CALM	240
	1975	Bombay High	ONGC	SBM	100,000	1-16"/CALM	240
	1977	Gulf of Kutch	IOC	SBM	300,000	2-24"/CALM	115
	1982	Bombay High	ONGC	IMODCO	2,500	SBBM	262
	1983	Bombay High	ONGC	IMODCO	150,000	1-16"/CALM	NA
	1984	Gulf of Kutch	IOC	IMODCO	100,000	CALM	101
	1985	Panna	ONGC	IMODCO	115,000	CALM	120
	1987	South Bassein	ONGC	SBM	N/A	2 SVMs	N/A
	1987	D-18	ONGC	IMODCO	115,000	1-16" CALM	300

Single point mooring around the world—*continued*

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
Indonesia	1970	Pang Kalan Susu	Pertamina	IMODCO	100,000	2-12"/CALM	NA
	1971	Balikappan	Union Oil	SBM	250,000	2-20" & 1-16"/CALM	102
	1971	Java Sea	ARCO	McDermott	45,000	1-8"	NA
	1971	Java Sea	IIAPCO	IMODCO	55,000	2-12"/CALM	120
	1972	Java Sea	ARCO	IMODCO	133,000	1-12" & 2-16"/CALM	135
	1972	Java Sea	IIAPCO	IMODCO	133,000	2-12" & 2-20"/CALM	130
	1973	Djatibarang	Pertamina	IMODCO	150,000	3-20"/CALM	75
	1973	Ardjuna	ARCO	SBM	150,000	3-16"/CALM	138
	1973	Ardjuna	ARCO	SBM	200,000	2-16"/CALM	126
	1974	Ardjuna	ARCO	SBM	60,000	SBS	140
	1974	Bekapai	Total	SBM	100,000	2-8"/CALM	123
	1975	Poleng	Cities Service	SBM	55,000	2-8"/SBS	180
	1976	Handil	Total	SBM	125,000	2-20"/CALM	105
	1977	Balongan	Pertamina	SBM	150,000	2-20" & 1-16"/CALM	74
	1978	Udang	Conoco	SBM	93,000	2-8"/SBS	302
	1980	Cinta	IIAPCO	IMODCO	133,000	2-12" & 2-20"/CALM	130
	1980	Semarang	Pertamina	SBM	17,000	1-16"/CALM	39
	1981	Krisna	IIAPCO	IMODCO	230,000	2-20", 2-16" & 1-6"/CALM	NA
	1981	Ardjuna	ARCO	SBM	56,000	1-6"/CALM	135
	1981	NA	LETJES	SOFEC	10,000	2-8"	60
	1981	Balikpapan	Pertamina	SBM	150,000	CALM	102
	1983	Lalang	BP	Bluewater	140,000	Yoke Tower	NA
	1983	Balongan	Pertamina	SBM	35,000	1-16"/CALM	46
	1983	Arun	Mobil	Bluewater	100,000	CALM	
	1984	Kakap	Marathon	SBM	140,000	SBS	295
	1985	West Madura	Kodeco	Bluewater	100,000	CALM	330
	1985	Kepiting	Conoco	Comb. Eng.	100,000	FPSO/CBM	330
Iran	1970	Cyrus	Ipac	SBM	140,000	2-16"/CALM	141
	1971	Iman Hasan	SIRIP	IMODCO Ltd	250,000	2-16"/CALM	82
	1983	Iman Hassan	NIOC	SBM	250,000	CALM	160
	1985	Bushire	Smit Tak.	SBM	150,000	CALM	118
	1985	Persian Gulf	NIOC	IMODCO Ltd	250,000	2-24" CALM 1-16"	85
	1985	Persian Gulf	NIOC	IMODCO Ltd	250,000	2-24" CALM 1-16"	100
	1985	Persian Gulf	NIOC	IMODCO Ltd	250,000	2-24" CALM 1-16"	94
	1985	Persian Gulf	NIOC	IMODCO Ltd	250,000	2-24" CALM 1-16"	Stored as spare
	1985	Persian Gulf	NIOC	IMODCO Ltd	250,000	2-24" CALM 1-16"	Stored as spare
	1985	Persian Gulf	NIOC	IMODCO Ltd	250,000	2-24" CALM 1-16"	Stored as spare
	1985	Persian Gulf	NIOC	IMODCO Ltd	250,000	2-24" CALM 1-16"	Stored as spare
Iraq	1981	Arabian Gulf	Brown & Root	IMODCO Ltd	270,000	2-24"	NA
	1981	Arabian Gulf	Brown & Root	IMODCO Ltd	270,000	2-24"	NA
	1981	Arabian Gulf	Brown & Root	SBM	270,000	2-24"	NA
	1981	Arabian Gulf	Brown & Root	SBM	270,000	2-24"	NA
Italy	1963	Fimicino	PURFINA	IMODCO	50,000	2-12"/CALM	49
	1963	Ravenna	SAROM	IMODCO	50,000	2-12"/CALM	NA
	1964	Fiumicino	PURFINA	Dalmine	100,000	1-16"/RMD	NA
	1970	Porto Torres	Sardoil	SBM	255,000	2-20"/CALM	101
	1972	Ancona	API	Lavore Adriatica Maritime	300,000	NA	NA

Single point mooring around the world—*continued*

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
	1972	Genoa	Port Authority	CIDONIO	500,000	2-20" & 2-12"	NA
	1978	Nilde	Agip	SBM	80,000	1-6"/SALS	312
	1981	Rospo Mare	Elf Italiana	EMH	35,000	2-10"	NA
	1981	Genoa	C.A.P.	Technomare	270,000	SALM (Inv)	
	1984	Vega	Montedison	EMH	250,000	SALMRA	394
	1985	Mila	Montedison	Bluewater	70,000	CALM/SYFPS	90
	1985	Nilde II	Agip	IMODCO	138,000	SPT 3-4" 12-1" hydraulic	329
	1985	Rospo Mare	Elf	SBM	140,000	FSO/turret	230
Ivory Coast	1980	Bouet	Societe Invoirienne de Raffinage	IMODCO	250,000	3-24"/CALM	164
	1981	Espoir	Phillips	Bluewater	240,000	1-12"/CALM	279
Japan	1961	Niigata	Shell	Niigata	100,000	1-20"/CALM	NA
	1963	Oita	Kyushu Oil	IMODCO	100,000	2-12"/CALM	177
	1965	Yokkaichi	Showa-Yokkaichi	Mitsubishi	100,000	2-16" & 1-16"/CALM	NA
	1965	Yokkaichi	Showa-Yokkaichi	Mitsubishi	100,000	2-16" & 1-16"/CALM	NA
	1965	Chiba	Maruzen Oil	IMODCO	100,000	3-12"/CALM	NA
	1967	Koshiba	US Army	IMODCO	100,000	2-12"/CALM	65
	1968	Hakozaki	US Army	IMODCO	100,000	2-16" & 2-12"/CALM	60
	1968	Kawasaki	Showa-Mitsubishi	Mitsubishi	265,000	2-24"/CALM	NA
	1968	Hakodate	Asia Oil	IMODCO	32,000	1-16"/CALM	49
	1968	Yokkaichi	Daikyo Oil	Mitsubishi	200,000	2-20"/CALM	NA
	1968	Yokkaichi	Daikyo Oil	Mitsubishi	230,000	2-20"/CALM	NA
	1969	Toyama	Japan Sea Oil	IMODCO	150,000	2-16"/CALM	NA
	1969	Yokohama	Ogishima Oil	Mitsubishi	200,000	2-20"/CALM	NA
	1969	Ube	Seibu Oil	Mitsubishi	200,000	2-20"/CALM	NA
	1970	Atsumi	Chubu Electric	Mitsubishi	200,000	2-20"/CALM	NA
	1970	Himeji	Idemitsui Oil	IMODCO	220,000	2-20"/CALM	NA
	1970	Buckner Bay	Toyo Gasoline	IMODCO	100,000	2-16"/CALM	NA
	1970	Tengan	US Army	IMODCO	50,000	2-12"/CALM	70
	1971	Nakagusuki Bay	Esso	Esso, Van Houten	250,000	2-24"/SALM	85
	1973	Ube	Seibu Oil	Mitsubishi	200,000	2-20"/CALM	NA
	1974	Kawasaki	Showa-Mitsubishi	Mitsubishi	300,000	2-20"/CALM	NA
	1975	Yokohama	Oghishima Oil	Mitsubishi	200,000	2-20"/CALM	NA
	1976	Yokkaichi	Showa-Yokkaichi	Mitsubishi	300,000	1-20" & 1-20"/CALM	NA
	1981	Mutsu-Ogawara	JNOC	SOFEC	350,000	2-24"/SALM	145
	1983	Fuqui	JNOC	SOFEC	240,000	2-20"/SALM	148
S Korea	1987	Inchon	NCS/Kudong Oil Co.	SBM	N/A	CALM	N/A
Kuwait	1967	Ras Al Khafji	Arabian Oil	McDermott	150,000	1-16" & 1-12"	NA
	1972	Ras Al Khafji	Arabian Oil	McDermott	250,000	1-24" & 1-10"	NA
	1977	Mina-Al-Ahmadi	KOC	ETPM	532,000	2-24" & 1-16"/RMD	NA
	1980	Ras al Kahfji	Arabian Oil	Mitsubishi	300,000	CALM	NA
Lebanon	1985	Beruit	Elec du Liban	EMH	40,000	SALM	118
Libya	1962	Brega	Esso	Esso	100,000	Fixed Tower/ Loading Arm	NA
	1965	Ras-es-Sider	Oasis	SBM	100,000	3-16"/CALM	101
	1968	Zueitina	Occidental	SBM	100,000	1-24"/CALM	100
	1968	Zueitina	Occidental	SBM	150,000	2-24"/CALM	105
	1968	Zueitina	Occidental	SBM	150,000	2-24"/CALM	105
	1969	Brega	Esso	Esso	300,000	1-24"/SALM	140
	1985	Marsa el Brega	Sirte Oil Co	Van Houten IMODCO Ltd	300,000	2-24" CALM	148
	1969	Ras Lanuf	Mobil	SBM	255,000	2-24"/CALM	96
	1969	Ras-es-Sider	Oasis	SBM	255,000	2-24"/CALM	101
	1974	Azzawiya	NOC	DBV/Woodfield	100,000	2-16"	NA
	1974	Azzawiya	NOC	DBV/Woodfield	30,000	1-8" & 1-10"	NA
	1976	Azzawiya	NOC	SBM	140,000	2-20"/SALM	85
	1976	Azzawiya	NOC	SBM	100,000	2-20"/SALM	98

Single point mooring around the world—*continued*

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
	1979	Zueitina	Occidental	IMODCO Ltd	275,000	2-24"/CALM	99
	1980	Ras-es-Sider	Oasis	SBM	300,000	2-24"/CALM	102
	1983	Ras-es-Sider	Oasis	IMODCO Ltd	NA	CALM	NA
Malaysia	1959	Miri	Shell	SBM	70,000	2-8" & 1-6"/CALM	48
	1959	Miri	Shell	SBM	70,000	2-12" & 1-16"/CALM	48
	1962	Miri	Shell	SBM	70,000	2-8" & 1-6"/CALM	48
	1962	Port Dickson	Shell	SBM	100,000	2-16"/CALM	90
	1963	Miri	Shell	SBM	70,000	2-12" & 1-6"/CALM	53
	1974	Labuan	Shell	SBM	313,000	2-20"/CALM	98
	1974	Tembungo	Exxon	SOFEC	94,000	1-10"/SALM	300
	1974	Pulai	Exxon	SBM	190,000	1-12"/SALM	240
	1977	Pulai	Exxon	SBM	166,000	SALS	216
	1978	Bintulu	Shell	SBM	210,000	2-20"/CALM	67
	1981	Trengganu	Petronas	SOFEC	85,000	2-20"/SALM	60
	1981	Trengganu	EPMI	SBM	250,000	1-24"/SALM	92
	1981	Trengganu	EPMI	SBM	250,000	1-24"/SALM	85
	1981	Paka	JGC Corp.	SOFEC	85,000	CALM	65
	1982	Port Dickson	Shell	Mitsubishi	100,000	CALM	
	1984	Lutong	Shell	SBM	125,000	CALM	77
	1984	Lutong II	Shell	SBM	125,000	CALM	77
Mexico	1973	Tuxpan	Pemex	IMODCO	60,000	2-16"/CALM	60
	1974	Tuxpan	Pemex	IMODCO	60,000	1-10" & 3-16"/CALM	67
	1976	Salina Cruz	Pemex	IMODCO	60,000	3-16" & 1-12"/CALM	75
	1976	Rosarito Beach	Pemex	IMODCO	60,000	1-20" & 2-16"/CALM	77
	1978	Rabon Grande	Pemex	IMODCO	150,000	1-16" & 2-20"/CALM	90
	1980	Cayo Arcas	Pemex	IMODCO	151,000	2-24" & 1-16"/CALM	144
	1980	Doc Bocas	Pemex	SBM	250,000	2-24" & 1-16"/CALM	93
	1981	Cayo Arcas	Pemex	SBM	250,000	2-20" & 1-16"/CALM	151
	1981	Dos Bocas	Pemex	SBM	250,000	2-24" & 1-16"/CALM	93
	1981	Salina Cruz	Pemex	Mitsubishi	250,000	2-24" & 1-16"/CALM	NA
	1981	Cayo Arcas	Pemex	EMH	285,000	2-20"/RMD	131
	1981	NA	Pemex	SOFEC	2,000	SBBM (21)	150
	1985	Unknown	Pemex	Mitsubishi	150,000	CALM	93
Morocco	1971	Mohammedia	RAPC	IMODCO	100,000	1-8" & 1-20"/CALM	72
New Caledonia	1977	Noumea	Le Nickel	SBM	100,000	1-20"/CALM	62
New Zealand	1971	Waipipi Point	Marcona Corp.	IMODCO	75,000	1-12"/CALM	64
	1972	Taharoa	New Zealand Steel	IMODCO	70,000	2-12"/CALM	77
	1976	Taharoa	New Zealand Steel	SBM	150,000	2-12"/CALM	105
Nigeria	1967	Lagos	Nidogas	IMODCO	2,000	1-3" & 1-4"/CALM	13
	1968	Escravos	Gulf	IMODCO	100,000	2-16"/CALM	70
	1968	Forcados	Shell	SBM	210,000	1-20"/CALM	83
	1968	Forcados	Shell	SBM	210,000	-124"/CALM	83
	1971	Forcados	Shell	SBM	313,000	1-24"/CALM	91
	1971	Bonny	Shell	SBM	313,000	1-24"/CALM	91
	1971	Bonny	Shell	SBM	313,000	1-24"/CALM	91
	1972	Brass River	Agip	IMODCO	200,000	2-20"/CALM	96
	1974	North Apoi	Texaco	SBM	50,000	2-20" & 1-12"/CALM	87
	1974	North Apoi	Texaco	SBM	250,000	2-20"/CALM	93
	1976	Brass River	Agip	IMODCO	250,000	2-20"/CALM	95
	1977	North Apoi	Texaco	SBM	250,000	2-24"/CALM	94
	1977	Escravos	Gulf	SBM	300,000	2-24"/CALM	102
	1979	Qua Iboe	Mobil	IMODCO	300,000	2-24"/CALM	95
	1984	Andanga	Ashland	SBM	285,000	SY-Jacket	134

Single point mooring around the world—*continued*

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
	1985	Qua Iboe	Mobil	IMODCO	380,000	2-24" CALM	95
	1985	Bonny	Shell	Bluewater	350,000	CALM	92
	1987	Brass	NAOC	SBM	N/A	CALM	N/A
North Yemen	1986	Salif	YEPCO	SOFEC	N/A	Turrent moored FSO	N/A
	1987	Ras Isa	YEPCO	SBM	N/A	CALM	N/A
Norway	1970	Ekofisk	Phillips	SBM	60,000	1-12"/CALM	232
	1970	Ekofisk	Phillips	SBM	150,000	1-12"/CALM	208
	1979	Statfjord B	Statoil	SBM	150,000	1-20"/ALP	480
	1982	Statfjord C	Statoil	SBM	150,000	1-20"/ALP	478
	1987	Statfjord A	Statoil	UKOLS	150,000	1-20"/subsea	480
	1986	Gullfaks A	Statoil	SBM	150,000	1-20"/ALP	445
	1987	Gullfaks B	Statoil	SBM	150,000	1-20"/ALP	445
Oman	1963	Mina-al-Fahal	P.D. Oman	SBM	100,000	2-8"/CALM	71
	1966	Mina-al-Fahal	P.D. Oman	SBM	165,000	2-16" & 1-8"/CALM	115
	1966	Mina-al-Fahal	P.D. Oman	SBM	165,000	2-20" & 2-8"/CALM	124
	1973	Mina-al-Fahal	P.D. Oman	SBM	500,000	2-20" & 2-8"/CALM	155
	1979	Mina-al-Fahal	P.D. Oman	SBM	350,000	2-20" & 2-12"/CALM	124
	1984	Kuria Muria	Shell	SBM	250,000	CALM	125
Panama	1981	Chiriqui Grande	Petroterminal de Panama	EMH	150,000	2-20"/CALM	NA
	1981	Chiriqui Grande	Petroterminal de Panama	EMH	150,000	2-20"/CALM	NA
	1983	Chiriqui Grande	Petroterminal de Panama	EMH	150,000	2-20"/CALM	NA
Philippines	1967	Subic Bay	US Navy	IMODCO	108,000	2-16" & 1-10"/CALM	85
	1977	S. Nido	Cities service	SBM	70,000	SBS	200
	1980	Bataan	Bataan Refining	SOFEC	300,000	2-24"/SALM	94
	1980	Cadlao	Amoco	SBM	127,000	SBS	318
	1982	Nido	Cities Service	Bluewater	55,000	2-10"/CALM	219
Qatar	1965	Halul	QGPC	SBM	100,000	2-16"/CALM	97
	1972	Halul	QGPC	McDermott	300,000	2-24"	NA
	1972	Umm Said	QGPC	IMODCO	300,000	1-20" & 1-24"/CALM	66
	1976	Doha	QGPC	SBM	65,000	1-6"/CALM	88
	1979	Halul	QGPC	SBM	540,000	2-20" & 1-10"/CALM	120
	1983	Umm Said	QGPC	IMODCO	500,000	CALM	NA
Saudi Arabia	1970	Zuluf	Aramco	SBM	250,000	2-24" & 1-16"/CALM	111
	1970	Zuluf	Aramco	SBM	450,000	2-24"/CALM	129
	1974	Ju'aymah	Aramco	McDermott	500,000	2-24" & 1-12"	NA
	1974	Ju'aymah	Aramco	McDermott	500,000	2-24" & 1-12"	NA
	1974	Ju'aymah	Aramco	McDermott	500,000	2-24" & 1-12"	NA
	1975	Ju'aymah	Aramco	SOFEC	750,000	2-24" & 1-12"/CALM	135
	1975	Ju'aymah	Aramco	SOFEC	750,000	2-24" & 1-12"/SALM	117
	1981	Ras Al Khafji	Aramco	Mitsubishi	300,000	1-24" & 1-10"/CALM	NA
	1987	Duba	ODR	SBM	N/A	CBM	N/A
Singapore	1971	Singapore Harbor	Esso	IMODCO	2,000	2-24"/CALM	88
	1974	Pulau Bukom	Shell	McDermott	300,000	2-24"	NA
	1980	Singapore Harbor	PSA	IMODCO	300,000	2-24"/CALM	105
South Africa	1969	Durban	Shell	SBM	210,000	2-20"/CALM	150
	1974	Durban	Shell	SBM	210,000	1-20"/CALM	150
South Korea	1963	Ulsan	KOC	IMODCO	75,000	2-12", 1-8" & 1-4"/CALM	65
	1969	Yosu	Honam Oil	IMODCO	100,000	2-16"/CALM	112
	1969	Ulsan	KOC	IMODCO	200,000	2-16" & 1-12"/CALM	88
	1977	Onsan	KIPCO	IMODCO	250,000	2-24"/CALM	90
	1980	Pusan	KOC	Mitsubishi	325,000	2-24" & 1-16"	NA

Single point mooring around the world—*continued*

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number/ Size/System	Water Depth (Ft.)
Spain	1966	Huelva	Rio Tinto	SBM	100,000	2-16"/CALM	75
	1971	Amposta	Shell	SBM	33,530	2-10"/CALM	209
	1973	Tarragona	Enpetrol	SBM	325,000	2-24" & 1-12"/CALM	135
	1975	Algeciras	Cepsa	DBV/Woodfield	500,000	2-20" & 1-12"	NA
	1976	Castellon	Shell	SBM	60,000	SALS	383
	1979	Badalona	Campsa	SOFEC	50,000	2-12"/SALM	107
Sri Lanka	1986	Columbo Harbor	Ceylon Pet. Co.	IMODCO	180,000	CALM 1-24"	95
Sudan	1983	Marsa Nimeiri	Chevron	SBM	250,000	CALM (HEX)	160
Sweden	1959	Dalaro	Swedish Navy	IMODCO	3,000	1-4"/CALM	150
Taiwan	1967	Tai-Chung	US Air Force	IMODCO	50,000	1-12"/CALM	76
	1968	Kaohsiung	CPC	IMODCO	100,000	2-16" & 1-10"/CALM	68
	1968	Tai-Chung	US Air Force	IMODCO	50,000	1-12"/CALM	76
	1971	Kaohsiung	CPC	SBM	250,000	2-20"/CALM	100
	1972	Kaohsiung	CPC	SBM	250,000	2-20"/CALM	115
	1979	Chu-Wei	CPC	IMODCO	250,000	2-20"/CALM	121
	1981	Ta-Lin-Po	CPC	SBM	250,000	2-24" & 1-16"/CALM	130
Tanzania	1971	Dar-Es-Salaam	Tanzanian Harbour Authorities	SBM	100,000	2-20"/CALM	78
	1982	Dar Es Salaam	T.H.A.	IMODCO	300,000	CALM	
Thailand	1979	Gulf of Thailand	Union	Bluewater	70,000	1-8"/CALM Yoke	NA
	1981	Erawan	Union	Bluewater	85,000	1-8"/CALM	219
Trinidad	1971	Galeota Point	Amoco	SBM	250,000	2-20"/CALM	95
	1973	Point-A-Pierre	Texaco	IMODCO	260,000	1-12" & 2-24"/CALM	78
	1976	Galeota Point	Amoco	IMODCO	250,000	2-20"/CALM	95
Tunisia	1972	Ashtart	Elf	SBM	170,000	SBS	220
	1974	Ashtart	Elf	SBM	100,000	1-20" CALM	220
	1978	Ashtart	Serept	SBM	137,000	1-20" & 1-10"/SBS	220
	1982	Tazerka	Shell/Tunirex	SBM	210,000	SALS	470
United Arab Emirates	1968	Fateh	Conoco	SBM	150,000	2-16"/CALM	103
	1972	Das Island	BP	IMODCO	300,000	2-24" & 1-16"/CALM	94
	1972	Fateh	Dubai Petroleum	McDermott	300,000	2-24"	NA
	1972	Mubarras Island	ADOC	SBM	200,000	1-24"/CALM	58
	1973	Mubarek	Crescent	SBM	350,000	2-20" & 1-16"/CALM	160
	1974	Abu-Al-Bu-Koosh	Total/ABK	SBM	100,000	2-12"/CALM	97
	1977	Das Island	ADMA	IMODCO	400,000	2-24" & 1-16"/CALM	94
	1977	Arzanah	Amerada Hess	SBM	252,000	1-12"/CALM	107
	1979	Fateh	Dupetco	IMODCO	120,000	2-20"/CALM	130
	1980	Zirku	Zadco	IMODCO	350,000	2-20" & 1-20"/CALM	95
	1980	Zakum Zirku	Zadco	IMODCO	350,000	2-20" & 1-20"/CALM	95
	1981	Sharjah	Amoco	SBM	300,000	1-20"/CALM	65
	1981	Abu-Al-Koosh	Total	EMH	232,799	1-10"	NA
	1983	Salah	Gulf Ras al Khaimah	IMODCO	300,000	CALM	100
United Kingdom	1965	Nore Estuary	BP	BP/Harland Wolff	100,000	NA	NA
	1970	Humber River	Conoco	SBM	210,000	1-24"/CALM	74
	1972	Auk	Shell/Esso	Shell/SBM	42,000	1-10"/ELSBM	280
	1973	Argyll	Hamilton Bros.	SBM	100,000	1-12"/CALM	252
	1975	Brent	Shell/Esso	Shell/HC	90,000	NA	NA
	1975	Anglesey	Shell	SBM	750,000	2-24" & 1-16"/CALM	127

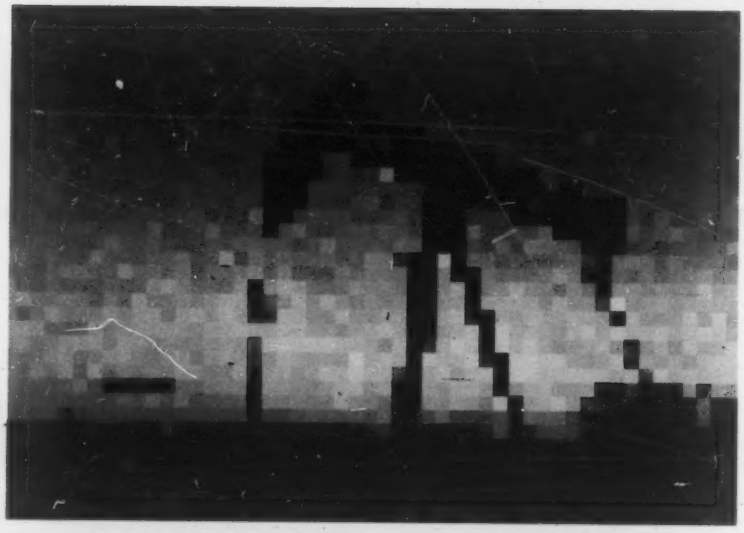
SHUTTLE TANKER NEPTUNE LEO moored in tandem to the floating production facility Jabiru Venture (Photo courtesy BHP).

Single point mooring around the world—*continued*

Country	Year	Port/Field	Owner	Designer/ Contractor	Max. Vessel Size (Dwt)	Hose number-Size/System	Water Depth (Ft.)
	1975	Scapa Flow	Occidental	Micoperi	250,000	NA	NA
	1975	Scapa Flow	Occidental	Micoperi	250,000	NA	NA
	1975	Thistle	BNOC	SBM	80,000	2-16"/SALM	535
	1977	Brent	Shell	SBM	80,000	1-16"/CALM	460
	1978	Buchan	BP	IMODCO	107,000	1-12"/CALM	369
	1979	Ninian	Chevron	IMODCO	3,500	SBBM	433
	1980	Ninian	Chevron	IMODCO	3,500	SBBM(4)	433
	1982	Maureen	Phillips	EMH	85,000	1-16"/AC	NA
	1980	Humber River	Conoco	SBM	280,000	1-24"/CALM	74
	1982	Beryl B	Mobil	EMH	80,000	1-16"/ALP	NA
	1984	Cardigan Bay	M.O.D.	Havron	10,000	SPLM	100
	1985	Fulmar	Shell	Bluewater	100,000	ALPRA/HEAD	360
	1985	Beryl A	Mobil	EMH	100,000	ALP	
United States	1967	Louisiana	Kerr-McGee	McDermott	8,000	1-4"	NA
	1978	Worldwide (portable)	US Navy Ltd	IMODCO	70,000	2-10"/CALM	65-200
	1980	Louisiana	Loop	SOFEC	700,000	2-24"/SALM	110
	1980	Louisiana	Loop	SOFEC	700,000	2-24"/SALM	112
	1980	Louisiana	Loop	SOFEC	700,000	2-24"/SALM	114
	1981	Santa Ynez	Exxon	IMODCO	50,000	1-12", 1-8", 6-1" & 1-6"/SALM	494
	1984	Unknown	Brown & Root	IMODCO	550,000	Chain SALM	125
	1984	Unknown	Brown & Root	IMODCO	550,000	Chain SALM	125
Uruguay	1975	Jose Ignacio	Ancap	SBM	150,000	2-24"/CALM	64
	1985	Jose Ignacio	Ancap	SBM	150,000	CALM	64
Venezuela	1968	Moron	CVP	SBM	100,000	2-16"/CALM	63
West Germany	1962	Cuxhaven	West Germany Navy	IMODCO	2,500	1-4"/CALM	26
Western Sahara	1961	El Aaiun	CEPSA	IMODCO	3,000	1-6"/CALM	28
Zaire	1975	Zaire	Gulf	IMODCO	100,000	2-16"/CALM	71
	1976	Zaire	Gulf	IMODCO	79,200	2016"/CALM	79

mooring arm on location. Because of the high pour point of the waxy crude, the piping systems are equipped with insulation and heat-tracing equipment.

The second contract, awarded in February 1988, calls for a similar system for the BZ-34-2 field in 65 ft of water in Bohai Bay. The system is due to be installed during 1989 as part of a field development using two wellhead platforms and a water injection platform. The mooring system will cater for the future addition of gaslift facilities and the tie-in of a third wellhead platform. PE



World upstream spending to show slight gain this year

What's influencing E&P spending

	1987	1988	1989
		Percent	
MAJORS			
Oil prices	—	—	61
Gas prices	—	—	22
Energy prices	50	19	—
Economics	23	6	17
Reserve replacement	18	31	17
Cash flow	18	—	17
Development commitments	14	31	6
Leases	5	13	6
Prospect availability	—	13	44
INDEPENDENTS			
Oil prices	—	—	47
Gas prices	—	—	44
Energy prices	49	29	—
Cash flow	43	19	25
Economics	23	33	15
Financial position	17	10	7
Gas markets	16	12	5
Prospect availability	6	21	14
Reserve replacement	2	14	6
Development spending	1	4	12
Capital availability	—	4	6

Source: Salomon Bros. Inc.

Breakout of exploration/production spending*

	1989	1988
	(Million U.S. $)	
MAJORS, U.S.†		
Amerada Hess	108	100
Amoco	1,400	1,500
ARCO	1,350	1,305
BP	925	970
Chevron	1,075	1,100
Coastal	50	50
Du Pont	475	400
Elf Aquitaine	83	139
Exxon	1,300	1,400
Kerr-McGee	112	102
Mobil	960	1,010
Murphy	33	26
Occidental	245	245
Pennzoil	240	210
Phillips	430	514
Royal Dutch/Shell	1,950	1,950
Sun E&P	435	490
Tenneco	0	250
Texaco	700	860
Total Minatome	82	74
Union Pacific	280	300
Unocal	400	440
USX	450	465
SELECTED INDEPENDENTS, U.S.†		
Adobe Oil & Gas	49	44
Amax Oil & Gas	30	12
Anadarko Petroleum	185	135
Apache Corp.	97	54
Arkla	55	48
Brooklyn Union	24	17
Burlington Resources	200	200
Cabot	50	47
Columbia Gas System	90	54
Consolidated Natural	244	244
Dekalb Energy	26	22
Diversified Energies	30	40
Enron	98	77
Enserch	95	113
Equitable Resources	58	65
Forest Oil	80	65
Freeport-McMoRan	100	100
Helmerich & Payne	25	18
Invexco	20	20
Kelley Oil	20	15
Louisiana Land	95	134
Maxus Energy	53	100
Mesa Petroleum	40	25
Mitchell Energy	55	49
Nerco Oil & Gas	25	5
Nicor	30	30
Noble Affiliates	50	48
Northern Michigan	50	29
Norcen Energy	51	44
Odeco	65	48
Pacific Enterprises	140	150
Placer Dome	20	18
Questar	31	23
Santa Fe Energy	45	45
Smith Co.	35	28
Sonat	55	49
Southdown	57	57
Transco Exploration	65	65
Union Texas	130	141
Wolverine	90	110
CANADA†		
Alberta Energy	45	45
Amerada Hess	35	35
Amoco	380	345
Anderson Exploration	27	30
Bow Valley	52	51
Canadian Hunter	131	115
Canadian Occidental	44	59
Chevron	265	220
Columbia Gas	35	20
Du Pont	30	30
Gulf Canada	185	286
Imperial	337	383
Mobil	160	160
Murphy Oil	24	26
Norcen Energy	74	91
North Canadian	59	76
Numac Oil	25	29
PanCanadian	220	244
Poco Petroleum	38	76
Sceptre Resources	29	38
Shell Canada	405	295
Suncor	50	54
Texaco Canada	279	248
Total Petroleum NA	30	20
Union Pacific	50	35
Unocal	70	80
OTHER INTERNATIONAL†		
Adobe Oil & Gas	11	13
Amerada Hess	223	225
Amoco	1,050	1,000
Ashland Oil	30	30
ARCO	315	330
Bow Valley	71	84
BP	2,805	2,090
Canadian Occidental	21	18
Chevron	675	600
Du Pont	380	440
Elf Aquitaine	1,420	1,450
Exxon	2,375	2,225
Gulf Canada	42	34
Hamilton Oil	75	64
Kerr-McGee	89	89
Lasmo plc	164	91
Louisiana Land	48	34
Maxus Energy	94	74
Mobil	755	630
Murphy	21	20
Norcen Energy	41	23
Norsk Hydro	540	600
Occidental	450	435
Odeco	32	19
Phillips	297	258
Ranger Oil	42	34
Renaissance Energy	59	114
Royal Dutch/Shell	2,100	2,100
Saga Petroleum	200	200
Statoil	747	648
Sun Co.	108	74
Texaco	450	450
Texas Eastern	100	75
Total SA	500	533
Triton Energy	70	68
Union Texas	100	94
Unocal	280	280
USX	320	310

*Estimates for both years. †Companies spending at least $20 million in either year.

Source: Salomon Bros. Inc

Worldwide oil and gas at a glance

COUNTRY	ESTIMATED PROVED RESERVES 1-1-89		OIL PRODUCTION			REFINING Capacity on 1-1-89				
	Oil (1,000 bbl)	Gas (bcf)	Producing wells* 12-31-87	Estimated 1988 (1,000 b/d)	% change from 1987	No. of ref.	Crude	Thermal operations	Catalytic cracking	Catalytic reforming
							b/cd			
ASIA-PACIFIC										
Australia	1,673,089	16,633	926	552.3	+0.4	10	644,100	...	190,300	159,600
Bangladesh	500	12,715	10	0.9	...	1	31,200	...	...	1,650
Brunei	1,400,000	11,600	608	138.3	−0.6	1	10,000	...	...	...
Burma	54,000	9,460	450	15.0	−21.1	2	26,300	1,700	...	...
China, Taiwan	5,000	885	81	2.6	...	2	570,000	13,500	22,500	56,250
India	6,354,200	22,861	2,670	631.8	+3.7	12	1,051,441	110,670	133,953	26,030
Indonesia	8,250,000	83,590	6,065	1,137.5	−4.1	6	714,200	81,700	12,600	61,500
Japan	54,500	1,410	387	12.3	+0.8	41	4,362,750	82,800	596,950	551,650
Korea, South	...	...	...	...	...	6	880,000	49,000	...	62,450
Malaysia	2,922,000	51,700	448	540.0	+8.4	4	209,300	...	...	21,980
New Zealand	182,650	5,150	40	28.0	−3.4	1	88,400	...	...	21,900
Pakistan	170,438	17,722	77	47.0	+11.9	3	130,050	...	...	5,450
Papua New Guinea	200,000	3,030	...	...	...	...	...	...	...	...
Philippines	15,800	9	11	9.2	+64.3	4	254,000	...	23,100	39,400
Singapore	...	...	...	...	...	5	852,000	137,700	...	58,300
Sri Lanka	...	...	...	...	...	1	50,000	12,500	...	3,750
Thailand	85,200	3,885	245	38.4	+20.0	3	191,045	16,920	8,100	26,280
Total Asia-Pacific	**21,367,377**	**240,650**	**12,018**	**3,153.3**	**+0.9**	**102**	**10,064,786**	**506,490**	**987,503**	**1,096,190**
WESTERN EUROPE										
Austria	100,000	420	1,198	23.2	+10.5	1	204,000	17,000	24,000	32,000
Belgium	...	...	...	...	...	4	630,500	62,800	102,000	80,300
Cyprus	...	...	...	...	...	1	17,100	...	...	4,250
Denmark	861,000	4,320	NA	95.5	+2.2	3	176,500	70,670	...	31,700
Finland	...	...	...	...	...	2	241,000	46,300	41,800	42,900
France	206,030	1,180	625	68.7	+5.7	14	1,875,970	152,850	319,200	247,000
Germany, West	408,000	9,393	3,088	77.9	+4.1	15	1,518,200	289,500	179,400	275,100
Greece	20,000	140	16	21.8	−3.1	4	384,500	41,120	50,500	51,300
Ireland	...	1,800	...	...	...	1	56,000	...	...	11,000
Italy-Sicily	739,000	10,240	174	92.9	+59.3	19	2,450,200	360,400	278,300	284,300
Netherlands	205,590	62,507	478	83.7	−2.3	7	1,380,700	154,360	125,500	166,400
Norway	10,435,000	85,500	215	1,069.1	+7.9	3	239,400	77,300	...	30,100
Portugal	...	...	...	...	...	3	313,300	...	10,100	52,200
Spain	25,955	840	47	30.4	−4.1	10	1,285,000	173,000	164,000	171,600
Sweden	...	...	...	...	...	5	426,500	67,000	25,000	71,000
Switzerland	...	...	...	...	...	2	132,000	20,000	...	26,000
Turkey	381,000	1,037	571	50.0	−2.5	5	724,654	4,500	34,128	63,127
United Kingdom	5,175,000	22,740	787	2,376.3	−3.1	15	1,803,100	152,000	442,000	307,500
Total Western Europe	**18,556,575**	**200,117**	**7,199**	**3,989.5**	**+1.1**	**114**	**13,858,624**	**1,688,800**	**1,795,928**	**1,947,777**
MIDDLE EAST										
Abu Dhabi	92,205,000	183,500	1,001	1,012.6	+4.6	2	180,000	...	...	30,055
Bahrain	126,000	6,700	274	42.3	+0.5	1	243,000	20,000	39,000	18,000
Dubai	4,000,000	5,015	150	355.3	−5.9	...	...	...	...	...
Iran	92,850,000	494,400	361	2,207.5	−4.4	4	530,000	80,800	...	63,845
Iraq	100,000,000	95,000	868	2,679.2	+23.5	8	318,500	...	...	43,500
Israel	1,619	30	10	0.3	...	2	180,000	70,000	20,000	26,000
Jordan	5,000	980	3	0.5	...	1	100,000	...	4,410	8,640
Kuwait	91,920,000	42,500	363	1,254.2	+11.8	4	817,000	54,000	42,000	33,000
Lebanon	...	...	...	...	...	2	37,000	...	7,250	7,492
Neutral Zone	5,210,000	12,300	492	316.3	−18.7	...	...	...	...	...
Oman	4,071,160	9,320	1,004	596.7	+7.1	1	76,932	...	...	15,386
Qatar	3,150,000	156,700	174	349.2	+23.8	1	62,000	...	...	12,030
Ras al Khaimah	400,000	2,000	6	10.0	...	...	...	...	...	...
Saudi Arabia	169,970,000	145,848	588	4,708.3	+16.9	7	1,375,000	32,000	76,000	180,900
Sharjah	1,500,000	11,000	20	65.0	...	...	...	...	...	...
Syria	1,730,000	13,130	963	273.3	+18.8	2	243,744	36,384	...	18,994
Yemen, North	1,000,000	3,700	12	159.9	+788.3	1	10,000	...	...	2,500
Yemen, South	3,380,000	...	...	12.5	+316.7	1	161,500	...	...	10,800
Total Middle East	**571,518,779**	**1,182,123**	**6,289**	**14,043.1**	**+11.7**	**37**	**4,334,676**	**293,184**	**188,660**	**471,142**

EDITOR'S NOTE: All reserves figures except those for the U.S.S.R. (and gas for Canada) are reported as proved reserves recoverable with present technology and prices. U.S.S.R. figures are "explored reserves" which include proved, probable, and some possible. Canadian gas figure, under criteria adopted by Canadian Petroleum Association in 1980, includes proved and some probable. *Does not include shut in, injection, or service wells. †Estimates based on capacity as of Jan. 1, 1989, plus known 1988 closures and expansions. §Includes Albania, Bulgaria, Cuba, Czechoslovakia, East Germany, Hungary, Mongolia, North Korea, Poland, Romania, Viet Nam, and Yugoslavia.

COUNTRY	ESTIMATED PROVED RESERVES 1-1-89		OIL PRODUCTION			REFINING Capacity on 1-1-89				
	Oil (1,000 bbl)	Gas (bcf)	Producing wells* 12-31-87	Estimated 1988 (1,000 b/d)	% change from 1987	No. of ref.	Crude	Thermal operations	Catalytic cracking	Catalytic reforming
							b/cd			
AFRICA										
Algeria	8,400,000	104,200	840	666.8	+2.7	4	464,700	...	...	55,600
Angola-Cabinda	2,024,000	1,900	396	449.3	+24.8	1	32,100	...	...	1,900
Benin	100,000	...	6	4.6	−13.2	...	...	...	...	...
Cameroon	400,000	3,880	175	170.0	−2.3	1	42,000	...	...	7,000
Congo	710,000	2,440	289	134.8	+9.6	1	21,000	...	...	2,000
Egypt	4,300,000	11,470	821	851.3	−5.0	8	489,203	16,470	...	30,940
Ethiopia	...	...	...	...	...	1	18,000	...	...	2,270
Gabon	720,000	600	299	175.0	+12.9	1	24,000	7,200	...	1,400
Ghana	1,000	...	0	...	...	1	26,600	...	...	5,850
Ivory Coast	120,000	3,530	17	12.9	−24.1	2	60,000	...	...	16,600
Kenya	...	...	...	...	...	1	90,000	...	...	9,000
Liberia	...	...	...	...	...	1	15,000	...	...	2,000
Libya	22,000,000	25,700	664	1,012.5	−7.1	3	329,400	...	...	13,982
Madagascar	...	...	...	...	...	1	16,350	7,000	...	2,600
Morocco	2,600	100	5	0.4	...	2	154,600	...	5,600	26,800
Mozambique	...	2,290	...	...	...	...	...	...	...	...
Nigeria	16,000,000	85,000	1,522	1,358.3	+9.4	4	414,500	...	84,000	71,000
Senegal	...	...	...	...	...	1	29,800	...	...	2,870
Sierra Leone	...	...	...	...	...	1	10,000	...	...	...
Somalia	...	210	...	...	...	1	10,000	...	...	...
South Africa	...	1,760	...	...	...	4	433,500	63,500	84,400	62,800
Sudan	300,000	3,000	...	...	...	1	21,440	...	...	1,700
Tanzania	...	4,100	...	...	...	1	13,500	...	...	3,000
Tunisia	1,790,000	3,100	152	102.8	−0.9	1	34,000	...	...	3,300
Zaire	96,170	30	110	29.5	−4.8	1	16,700	...	...	3,500
Zambia	...	...	...	...	...	1	20,594	...	...	5,070
Total Africa	**56,963,770**	**253,310**	**5,296**	**4,968.2**	**+2.5**	**44**	**2,786,987**	**94,170**	**174,000**	**331,182**
WESTERN HEMISPHERE										
Argentina	2,268,000	26,700	8,389	449.6	+5.5	11	690,400	125,100	124,800	41,000
Barbados	3,300	7	80	1.1	...	1	3,000	...	...	...
Bolivia	176,200	5,354	300	18.8	−0.5	3	57,500	...	...	14,900
Brazil	2,550,000	3,700	5,909	555.6	−1.8	13	1,407,300	33,800	350,500	24,800
Canada	6,785,514	95,100	37,882	1,604.6	+4.7	27	1,855,800	88,250	387,600	369,600
Chile	287,000	4,200	325	24.8	+1.2	3	146,800	20,000	36,670	10,000
Colombia	2,028,000	3,943	2,711	346.7	−9.9	4	227,400	60,000	91,000	6,000
Costa Rica	...	...	...	...	...	1	16,200	6,500	...	1,200
Dominican Republic	...	...	...	...	...	2	47,000	...	...	7,500
Ecuador	1,350,000	4,020	942	310.1	+77.5	3	123,300	25,200	16,000	2,780
El Salvador	...	...	...	...	...	1	17,000	...	...	3,800
Guatemala	80,830	20	15	3.7	...	1	16,000	...	...	3,000
Honduras	...	...	...	...	...	1	14,000	...	...	1,800
Jamaica	...	...	...	...	...	1	34,200	...	...	3,240
Martinique	...	...	...	...	...	1	12,800	...	...	7,410
Mexico	54,110,000	74,831	3,768	2,527.3	−0.5	9	1,354,000	82,000	267,000	157,800
Netherlands Antilles	...	...	...	...	...	1	320,000	67,000	42,000	15,000
Nicaragua	...	...	...	...	...	1	14,500	...	...	2,800
Panama	...	...	...	...	...	1	100,000	...	...	7,500
Paraguay	...	...	...	...	...	1	7,500	...	...	...
Peru	456,806	623	3,529	141.7	−13.4	6	172,438	...	22,540	1,680
Puerto Rico	...	...	...	...	...	2	123,000	...	12,000	5,800
Suriname	28,700	...	74	2.6	+13.0	...	...	...	...	...
Trinidad & Tobago	528,000	10,500	3,255	149.3	−4.9	2	300,000	18,000	28,000	31,000
Uruguay	...	...	...	...	...	1	33,000	...	4,100	2,500
Venezuela	58,083,900	102,243	28,101	1,658.0	+4.5	6	1,201,100	138,000	193,100	6,000
Virgin Islands	...	...	...	...	...	1	545,000	80,000	...	125,000
United States	26,500,000	187,200	613,430	8,165.9	−2.2	†182	†15,556,700	†1,877,400	†5,336,100	†3,839,400
Total Western Hemisphere	**155,236,250**	**518,441**	**708,710**	**15,959.8**	**+0.2**	**286**	**24,395,938**	**2,621,250**	**6,911,410**	**4,691,510**
Total non-Communist	**823,642,751**	**2,394,641**	**739,512**	**42,113.9**	**+4.2**	**583**	**55,441,011**	**5,203,894**	**10,057,501**	**8,537,801**
COMMUNIST AREAS										
China	23,550,000	31,700	39,500	2,690.3	+0.3	40	2,200,000	NA	NA	NA
U.S.S.R.	58,500,000	1,500,000	128,000	12,476.8	...	39	12,300,000	NA	NA	NA
Other§	1,750,000	29,000	NA	422.0	−1.9	45	3,298,135	NA	NA	NA
Total Communist	**83,800,000**	**1,560,700**	**167,500**	**15,589.1**	**...**	**124**	**17,798,135**	**NA**	**NA**	**NA**
TOTAL WORLD	**907,442,751**	**3,955,341**	**907,012**	**57,703.0**	**+3.0**	**707**	**73,239,146**	**5,203,894**	**10,057,501**	**8,537,801**

Worldwide Production

• Offshore (e) Estimated (c) Condensate (NA) Not available

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
ABU DHABI	DEPARTMENT OF PETROLEUM	Asab, 1965	8,000- 8,700	106	248	242,900	1,476,700,000	40.8
		Bab, 1958	8,600- 9,300	100	232		680,100,000	40.6
		Bu Hasa, 1962	8,300- 9,200	201	371	335,500	2,785,700,000	39.0
		Sahil, 1967	9,500- 9,800	22	52	7,700	57,000,000	39.7
		• Umm Shaif, 1958	9,800-12,000	142	203	139,400	1,398,600,000	37.0
		• Zakum Lower, 1963	8,000-9,000	131	254	103,700	1,212,700,000	39.0
		• Zakum Upper, 1963	7,000-8,000	142	262	167,300	364,700,000	35.0
		• Umm Addalkh, 1969	7,700-8,500	32	54	11,200	9,300,000	32.5
		• Satah, 1975	8,550-9,500	10	21	4,600	1,700,000	39.8
		• Arzanah, 1973	11,000-11,300	14	34	11,500,000	38,900,000	44.6
		• Abu Al Bukhoosh, 1969	8,900-10,900	42	48	21,300	300,200,000	32.0
		• Mubarraz, 1969	8,300-10,000	28	28	15,300	99,500,000	37.0
*This represents only Abu Dhabi's share of 50% in the field.		• Bunduq,* 1964	9,400-10,900	23	40	11,700	22,800,000	40.0
		Total Abu Dhabi		1,001	1,863	1,083,400	8,458,900,000	
ALGERIA(e)	SONATRACH	Zarzaitine, 1957	4,700					42.2
		Edjeleh, 1956	1,500- 2,800					37.2
		Tiguentourine, 1966	2,160- 4,265					44.4
		El Adeb Lareche, 1958	4,100					43.3
		Assakaifaf N. & S., 1958	2,800					42.7
		Tan Emellel N. & S., 1960	2,800- 4,500					42.5
		Edeyen, 1964	5,580					41.5
		Hassi Mazoula S., 1963	4,430					40.2
		Hassi Mazoula B., 1965	4,920					42.0
		Acheb W. & Kreb, 1963 & 1960	7,360					45.6
		Tin Fouye N. + F6, 1962	4,265					39.6
		El Borma, 1967	8,200					42.9
		Keskassa, 1968	8,860					42.9
		Mereksen, 1974	9,420					45.8
		Gara, 1962	9,420					42.9
		Hassi Messaoud N., 1956	10,500					45.9
		Hassi Messaoud S., 1956	10,500					46.1
		Gassi-Touil & Gassi-Touil E., 1961	6,890					50.6-50.8
		Hassi Chergui	8,200					50.6
		Nezla N., 1965	8,530					51.5
		Rhourde El Baguel, 1962	9,850					40.2
		Mesdar E. & W., 1972	11,155					40.3
		El Gassi-El Agreb, 1959	10,176	840	840	649,000	7,537,780,000	47.9
		Rhourde Nouss & E., 1972	8,530					39.7
		Tin Foye Tabankort, 1966	4,600- 6,560					41.1-41.3
		Djoua W., 1967	5,580- 6,240					41.1
		Amassak, 1970	6,565					41.1
		Tamendjelt, 1970	5,585- 6,890					41.1
		Timedratine, 1964	8,155					42.7
		Ohanet N. & S., 1960	7,878					43.8
		Askarene, 1962	8,200					41.7
		Guelta, 1962	8,960					41.7
		Stah, 1971	9,515					45.8
		Ras Toumb, 1976	9,190					35.7
		Haoud Berkaoui-Ben Kahla, 1965	11,000					43.6
		Guellala-Guellala N.E., 1969	11,320					42.2-42.3
		N'Goussa, 1974	11,715					42.2
		Kef El Argoub, 1973	12,570					42.2
		Oued Noumer, 1969	8,860					48.3
		Djorf, 1974	9,025					48.3
		Djebel Onk, 1960	3,940					37.0
		Airar FJT						
		Hassi R'Mel[c]						
		Gassi Touil[c]						
		Total Algeria		840	840	649,000	7,537,780,000	
ANGOLA	FINA ANGOLA	Benfica, 1955	8,300		14		2,267,118	30.0
		Cacuaco, 1958	7,870	1	12	26	255,153	30.0
		Galinda, 1959	7,220		8		2,245,401	30.0
		Tobias, 1961	1,970	1	12	55	28,824,501	31.0
		Mulenvos, 1966	5,900- 6,600	7	16	154	5,012,135	25.0
		Quenguela, 1968	6,000	24	58	2,089	37,131,908	31.0
		Legua, 1972	6,300	1	3	105	661,375	31.0

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Bento, 1972	7,350	1	5	276	4,901,014	26.0
	C. Cobra, 1969	4,000	9	15	1,068	3,012,952	41.0
	Quinguila, 1972	3,400	18	31	8,035	33,117,951	36.0
	N'Zombo, 1973	5,000- 6,300	24	37	11,302	87,556,808	33.0
	Quinfuquena, 1975	6,800- 7,100	14	18	4,659	24,271,920	32.0
	Ganda, 1975	5,000	4	5	3,046	5,842,561	36.0
	Sereia, 1974	6,200	3	4	607	1,073,417	27.0
	Lumueno, 1977	4,600	8	23	2,792	2,676,720	37.0
	Pambo, 1982	4,600	4	4	722	1,681,821	39.0
	Luango, 1977	3,800	3	6	682	1,942,609	38.0
	Pinda, 1966	6,709	...	4	8	2,824	26.0
CHEVRON	• Malongo North, 1966	1,170- 9,250	58	73	13,411	210,363,571	30.0
	• Malongo West, 1969	1,680- 8,800	22	49	18,485	230,464,506	22.5
	• Malongo South, 1966	1,150- 1,440	29	33	9,108	72,399,649	25.0
	• Kali, 1969	11,400-11,660	...	1	288	4,222,347	30.0
	• Kungulo, 1975	4,000	16	17	10,305	43,099,612	32.2
	• Limba, 1969	2,660- 7,350	10	14	10,768	85,107,068	31.6
	• Kambala, 1971	10,500	4	5	6,389	17,552,178	32.8
	• Livuite, 1979	8,000	4	7	445	2,476,298	31.7
	• Takula, 1971	3,070- 9,090	64	72	121,883	155,574,940	31.5
	• Lifuma, 1984	7,800	...	1	...	184,404	31.4
	• Vuko, 1983	3,700	4	6	8,465	6,839,692	35.0
	• Wamba, 1982	2,700	6	7	24,969	9,113,557	29.0
	Numbi, 1980	3,446	15	15	6,358	2,320,774	34.0
TEXACO	• Cuntala, 1978	7,200	1	3	87	2,184,064	31.0
	• Essungo, 1975	6,500	10	12	4,781	19,387,494	35.0
	Lombo Este, 1983	7,800	4	6	794	189,714	41.0
	Tubarão, 1984	7,600	4	5	1,859	678,537	41.0
	Sulele Oeste, 1985	7,600	1	1	140	51,130	41.0
ELF ANGOLA	• Palanca, 1981	8,860	12	23	45,100	39,702,361	40.0
	• Pacassa, 1982	11,500	10	13	40,164	18,206,769	38.0
	Total Angola		**396**	**638**	**359,425**	**1,162,696,943**	
ARGENTINA[e] YPF	Chubut, 1907	1,908- 9,168	2,171	2,220			21.1-26.0
	Jujuy, 1969	2,461-16,732	9	10			46.5-47.0
	La Pampa, 1968	3,609- 4,921	180	185			31.0
	Mendoza, 1932	2,178-16,778	1,087	1,113			23.7-32.0
	Neuquen, 1918	1,312-12,498	986	1,049	426,000	4,394,925,000	24.0-41.0
	Rio Negro, 1960	2,953- 7,546	794	853			22.5-41.0
	Salta, 1928	6,551-15,092	41	60			29.0-59.0
	Santa Cruz, 1946	1,468-17,060	2,935	3,014			21.1-30.0
	Tierra del Fuego, 1959	5,249- 7,824	182	196			43.4-46.0
	Formosa, 1984	11,466-11,490	4	5			42.0-42.9
	Total Argentina		**8,389**	**8,705**	**426,000**	**4,394,925,000**	
AUSTRALIA BARRACK ENERGY	Mount Horner, 1965	3,800- 5,800	2	7	26	20,240	38.0
BHP PETROLEUM PTY. LTD	• Jabiru, 1983	4,786	2	2	14,352	7,565,029	42.3
BOND CORP., PETROLEUM DIVISION	• Harriet, 1983	6,230	10	10	10,760	6,668,000	38.2
CSR OIL & GAS DIV. BRISBANE	Anabranch, 1965	4,188	...	1	4	13,701	44.0
	Duarran, 1964	4,105	...	1	...	14,036	37.0
	Maffra, 1965	4,251	1	2	17	28,086	48.0
	Richmond, 1963	3,643	...	1	2	16,345	43.0
	Snake Creek, 1964	4,990	...	1	4	12,658	67.0
	Sunny Bank, 1962	6,139	...	1	...	706	40.0
	Trinidad, 1965	4,599	...	2	3	63,446	46.0
ESSO-BHP	• Barracouta, 1965	4,550	2	2	3,690	33,277,000	62.8
	• Marlin, 1966	5,100	1	4	11,410	54,629,500	50.0
	• Kingfish, 1967	7,500	26	37	43,440	934,636,400	46.9
	• Halibut, 1967	7,700	10	17	64,290	689,006,000	43.3
	• Mackerel, 1969	7,700	18	18	80,790	347,077,800	45.6
	• Tuna, 1968	6,500	20	22	6,780	32,786,700	40.5
	• Snapper, 1968	4,350	16	21	4,710	11,906,400	47.0
	• Cobia, 1972	7,700	10	12	49,620	65,075,900	44.6
	• West Kingfish, 1968	7,500	15	18	41,800	46,622,780	46.9
	• Fortescue, 1978	7,700	23	25	91,930	142,895,000	43.0
	• Flounder, 1968	8,200	8	10	16,960	13,271,900	46.7
HARTOGEN GROUP	Kooroopa, 1985	3,300	1	1	9	12,312	42.0
	Talgeberry, 1985	3,900	3	3	356	217,882	46.0
	Washpool, 1985	5,250	1	1	4	715	35.0
	Toobunyah, 1985	3,500	5	5	300	198,683	43.0
	Takyah, 1985	3,800	2	2	11	8,708	43.0
	Ipundu, 1986	2,700	1	1	77	44,129	43.0
	Borah Creek, 1982	4,900	1	3	36	11,584	34.0
	Kincora, 1980	4,700	2	2	33	296,342	34.0
	Sandy Creek, 1982	4,900	1	1	4	8,685	34.0

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Waratah, 1982	5,350	4	4	71	262,047	34.0
	Tintaburra, 1984	3,500	6	6	449	424,864	43.0
	Monlor, 1987	4,150	1	1	68	5,875	49.0
	Cranstoun, 1987	4,250	1	1	140	4,071	48.0
HOME ENERGY	Blina, 1981	4,300	6	6	438	1,058,202	37.0
	Sundown, 1983	3,600	4	4	65	165,626	39.0
	West Terrace, 1985	3,800	1	1	55	105,686	33.0
	Lloyd, 1987	4,806	1	1	94	14,419	37.0
LASMO	Bodalla South, 1984	4,800- 5,230	6	6	2,425	2,758,481	47.2-48.7
	Kenmore, 1985	4,600- 4,980	9	9	2,639	1,959,951	48.2-45.8
	Black Stump, 1986	5,360	1	1	126	118,373	45.2
	Glenvale, 1985	3,800	1	1	37	17,834	49.3
SANTOS LTD.	Jackson, 1981	4,750	32	32	16,354	18,834,000	40.0-48.0
	Jackson South, 1982	4,800	6	6	1,144	1,884,000	40.8
	Chookoo, 1985	6,000	3	3	306	245,000	45.0
	Wilson, 1983	5,000	5	5	458	526,000	40.0
	Naccowlah South, 1983	6,000	7	7	914	2,069,000	40.0-46.0
	Gunna, 1983	6,000	1	1	37	71,000	40.0
	Tinpilla, 1983	6,000	1	1	38	66,000	40.0
	Naccowlah West, 1983	5,700	8	8	1,195	1,546,000	40.0
	Bogala, 1984	6,900	2	2	159	244,000	40.0
	Yanda, 1984	8,000	1	1	92	41,000	40.0
	Mooliampah, 1985	6,000	1	1	76	64,000	40.0
	Watson South, 1985	5,500	1	1	825	511,000	40.0
	Sigma, 1983	5,700	2	2	132	71,000	40.0
	Tickalara, 1984	5,600	4	4	291	149,000	40.0
	Big Lake, 1984	6,600	2	2	298	280,000	45.0-48.0
	Gidgealpa, 1984	6,150	10	11	1,809	2,004,000	45.0-50.0
	McKinlay, 1985	5,100	1	1	36	26,000	41.0
	Strzelecki, 1978	5,800	16	16	4,518	11,305,000	43.0-49.0
	Dullingari, 1979	5,200	16	17	3,787	6,587,000	54.0
	Narcoonowie, 1983	6,000	2	2	134	118,000	52.0-53.0
	Limestone Creek Biala, 1984	5,100	9	9	1,454	992,000	41.0
	Wancoocha, 1984	6,000	5	5	818	1,060,000	44.0-54.0
	Muteroo, 1985	6,000	3	3	1,785	1,512,000	45.0
	Spencer, 1986	6,500	4	5	1,038	468,000	47.0
	Jena, 1985	5,200	1	1	83	56,000	41.0
	Alwyn, 1985	5,200	1	1	127	77,000	41.0
	Merrimelia, 1983		9	9	1,252	2,507,000	
	Meranji, 1985		3	3	401	317,000	
	Bookabourdie, 1985		2	2	116	48,000	
	Dirkala, 1986	7,000	1	1	697	474,000	56.0
	Nungaroo, 1985	4,150	1	1	74	39,000	40.0
	Ulandi, 1985	5,200	1	1	63	62,000	40.4
	Watson, 1985		2	2	206	64,000	
	Cooroo Cooroo North, 1986		3	3	1,438	473,000	
	Challum, 1983		1	1	19	13,000	
	Kerinna, 1984	4,300	1	1	29	15,000	41.0
	Kercummura, 1985					1,000	50.8
	Cook, 1985				25	23,000	
	Toby, 1987		1	1	5	1,000	
	Dingera, 1987		1	1	NA		
	Pitchery, 1988		1	1	NA		
	Munro, 1988		1	1	NA		
	Naccowlah East, 1988		1	1	NA		
	Mawson, 1987		1	1	173	51,000	
	Pintari North, 1988		1	1	NA		
	Taloola, 1988		2	2	NA		
	Sturt, 1988		1	1	NA		
	Tantanna, 1988		3	3	NA		
	Tirrawarra, 1970	9,500	28	35	4,770	7,685,227	52.0
	Moorari, 1971	7,705- 9,400	5	6	615	1,163,619	46.9
	Fly Lake, 1971	9,300	1	3	94	469,454	53.0
	Brolga, 1983	9,547	1	1	39	45,211	53.0
	Woolkina, 1982	9,700	1	1	26	98,546	51.5
TMOC RESOURCES LTD.	Moonie, 1961	5,800	27	36	658	21,679,619	44.5
	Alton, 1964	6,000		9	26	1,890,105	49.5
	Bennett, 1965	5,960	1	2	5	115,704	45.0
	Cabawin, 1961	10,800	1	1	6	59,972	49.0
	Mereenie, 1964	4,000	24	36	2,581	3,209,269	48.9
WAPET GROUP	Barrow Island, 1964	1,200- 6,700	407	516	17,447	224,561,262	37.7
	Dongara, 1969	5,250- 5,577	5	9	111	927,370	35.5
WOODSIDE	North Rankin,[c] 1972	9,800	8	13	14,820	10,374,000	52.3
BRIDGE OIL LTD.[e]	Thomby Creek, 1979	5,180		4			50.0
	Yellow Bank Creek, 1982	5,064	2	3			52.0
	Louise, 1986	5,900	1	2			59.0
	Narrows, 1986	5,740	1	1			59.0
PANCONTINENTAL PETROLEUM LTD.[e]	Nockatunga, 1983	5,420	4	5	18,372	7,357,000	49.6
	Winna, 1985	4,526	1	1			46.3

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Koora, 1985	4,822	1	2			41.7
		Thungo, 1986	4,670	1	1			45.7
		Kihee, 1986	3,200	1	1			44.7
	STRATA OIL[e]	Woodada,[d] 1980	7,400	...	...			54.0
	WESTERN MINING CORP.	North Herald, 1982	3,937	1	1	...	15,914	44.0
		South Pepper, 1982	4,036	1	1	...	345	44.0
		Total Australia		**926**	**1,148**	**550,000**	**2,737,768,713**	
AUSTRIA	MOBIL	Voitsdorf, 1963	7,000	18	36	398	21,568,397	36.0
		Sattledt, 1971	5,700	12	20	441	5,023,043	37.0
		Kemating, 1979	6,100	8	9	940	3,675,281	34.0
		Gaiselberg, 1938	5,200	32	71	774	32,123,128	27.0
		Other		88	117	1,596	26,108,744	32.0
	OEMV	Hochleiten, 1977	3,100- 5,000					21.3
		Matzen, 1949	6,100					25.7
		Pirawarth, 1957	1,600- 6,500	1,040	1,040	15,795	571,329,890	28.4
		St. Ulrich, 1938	1,600- 4,300					31.1
		Other						...
		Total Austria		**1,198**	**1,293**	**19,944**	**650,828,483**	
BAHRAIN	BANOCO	Awali, 1932	1,850- 4,600	274	374	39,290	784,000,000	33.0
		Total Bahrain		**274**	**374**	**39,290**	**784,000,000**	
BARBADOS	BARB. NOC	Woodbourne, 1966	1,665- 6,701	80	135	1,361	4,590,303	27.0
		Total Barbados		**80**	**135**	**1,361**	**4,590,303**	
BENIN[e]	PAN OCEAN	Seme, 1968	6,232	6	6	5,300	11,529,000	22.6
		Total Benin		**6**	**6**	**5,300**	**11,529,000**	
BOLIVIA	YPFB	Camiri, 1927	3,936	45	54	485	46,286,707	55.0
		Carand, 1960	3,940	33	37	349	54,114,187	60.0
		Colpa, 1961	9,184	15	15	238	18,168,729	65.0
		Monteagudo, 1966	4,592	25	29	1,600	31,531,126	41.0
		La Pena, 1965	8,856	17	23	4,734	24,974,160	43.0
		Palmar, 1964	10,758	6	6	93	1,686,528	65.0
		Rio Grande, 1961	9,512	37	37	2,604	59,966,393	62.0
		Vuelta Grande, 1978	8,220	6	12	1,050	1,791,995	67.0
		Espino, 1979	14,655	1	3	61	964,698	56.2
		San Roque, 1981	7,170	5	6	726	417,724	71.0
		Santa Cruz, 1986	9,350	5	11	1,524	1,099,149	65.0
		H. Suarez R., 1982	7,820	2	5	140	474,547	35.0
		Villamontes, 1987	9,770	2	4	429	156,668	57.0
		Other	...	79	79	683	30,785,458	...
	OCCIDENTAL	Tita, 1976	6,450	10	15	171	4,332,766	67.9
		Porvenir, 1978	9,600	6	9	2,881	10,330,669	60.5
	TESORO BOLIVIA	La Vertiente, 1977	15,230	6	7	1,110	4,065,393	64.1
		Escondido, 1980	11,293	...	3	...	...	60.0
		Taiguati, 1981	10,174	...	1	...	...	63.0
		Los Suris, 1981	13,577	...	1	...	...	50.0
		Total Bolivia		**300**	**357**	**18,878**	**293,146,897**	
BRAZIL	ALAGOAS	Furado, 1969	4,440- 5,500	50	58	2,315	13,793,400	35.0
		Pilar, 1981	4,100- 5,100	73	78	6,820	9,695,800	40.0
		Tabuleiro de Martins, 1957	3,900- 4,950	27	28	460	3,835,000	27.0
		Mero, 1974	6,500- 7,400	...	...	...	150,950	35.0
		Other	...	20	24	350	1,769,400	...
	AMAZONAS	Igarape Cuia, 1985	3,600- 3,700	...	1	...	25,250	41.0
		Rio Urucu, 1986	7,500- 8,300	...	...	...	...	44.0
	BAHIA	Agua Grande, 1951	820- 4,265	129	135	5,220	73,575,800	40.0
		Aracas, 1965	3,280- 8,856	170	172	7,080	109,178,300	41.0
		Buracica, 1959	1,476- 1,840	222	225	6,910	135,632,600	35.0
		Faz. Imbe, 1964	2,130- 5,575	65	70	1,825	14,686,100	40.0
		Faz. Boa Esperanca, 1966	7,215- 8,036	19	22	640	1,510,300	39.0
		Faz. Panelas, 1962	2,400- 5,100	13	14	400	6,415,300	37.0
		Malombe, 1966	3,280	18	21	430	6,824,600	41.0
		Mata Remanso, 1971	4,445- 4,560	77	91	60	19,498,400	35.0
		Miranga, 1965	3,280- 3,936	228	232	9,670	186,914,000	40.0
		Rio Dos Ovos, 1979	2,410- 3,750	3	16	350	1,901,200	35.0
		Santana, 1962	2,400- 4,000	7	7	240	5,533,700	37.0
		Sesmaria, 1963	3,100- 4,600	38	39	900	2,847,600	40.0
		Candeias, 1941	3,280- 7,415	36	36	2,770	77,415,500	30.0
		Cassarongongo, 1959	1,475- 4,755	80	86	1,300	14,484,800	32.0

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Dom Joao Terra, 1947	920- 1,350	71	71	900	20,336,800	38.0
	Riacho da Barra, 1982	2,910- 3,998	58	58	4,120	10,410,900	39.0
	Taquipe, 1958	3,115- 3,935	107	108	4,790	84,255,600	40.0
	• Candeias Mar, 1941	3,300- 7,400	...	15	490	6,889,200	30.0
	• Dom Joao Mar, 1947	920- 3,000	293	296	4,440	81,049,100	38.0
	• Ilheus, 1979	1,500	...	...	...	895,470	41.0
	Cexis, 1983	1,670- 5,230	21	23	1,940	2,944,800	30.0
	Faz. Balsamo, 1983	2,500- 4,000	141	153	8,250	6,254,300	31.0
	Rio Pojuca, 1982	5,600- 6,200	25	25	1,780	3,653,300	35.0
	Faz. Alvorada, 1983	2,100- 4,900	81	92	6,110	4,644,300	31.0
	Rio do Bú, 1984	2,900- 3,000	42	48	2,570	1,730,300	33.0
	Other	...	165	170	610	20,912,200	...
CEARÁ	Faz. Belem, 1980	1,150- 2,500	286	295	2,220	4,008,100	13.0
	• Curima, 1978	6,888	16	17	6,240	17,046,400	32.0
	• Xareu, 1977	5,717- 5,766	27	28	3,600	13,[illegible]3,200	39.0
	• Atum, 1983	5,800- 6,750	9	10	3,590	9,715,500	25.0
	• Espada, 1983	5,750- 6,900	6	6	1,770	3,382,700	26.0
ESPIRITO SANTO	Faz. Cedro, 1962	5,248	31	33	1,160	9,683,000	28.0
	Sao Mateus, 1969	5,750	78	81	1,490	4,090,750	27.0
	Lagoa Parda, 1977	5,576	43	44	3,780	20,621,250	30.0
	Rio Itaunas, 1977	5,400	41	43	1,080	3,326,300	28.0
	• Cacao, 1978	9,184	4	5	1,030	8,493,000	32.0
	Lagoa Suruaca, 1982	6,400	15	24	1,530	4,516,300	30.0
	Lagoa Piabanha, 1984	6,500	7	11	640	1,564,750	27.0
	Rio Preto/Oeste/Sul, 1976	...	38	40	880	1,813,600	...
	Other	...	67	72	1,820	1,997,740	...
RIO DE JANEIRO	• Enchova, 1976	6,973- 7,885	20	26	31,010	72,174,800	23.0
	• Bonito, 1977	6,950- 8,000	14	17	10,500	28,425,200	27.0
	• Garoupa, 1974	11,382	16	20	21,780	62,421,500	30.0
	• Namorado, 1975	10,083	34	42	62,510	189,920,000	28.0
	• Garoupinha, 1974	12,693	3	4	4,040	10,416,000	30.0
	• Pampo, 1977	6,215	27	32	58,640	93,758,300	21.0
	• Area RJS-236 Trilha, 1983	8,800-11,000	4	4	5,210	9,094,000	28.0
	• Linguado, 1981	9,000-11,000	12	15	31,715	53,547,300	20.0
	• Badejo, 1981	8,500-10,500	10	12	7,760	15,694,300	28.0
	• Bicudo, 1982	8,000-11,000	10	12	11,510	31,208,100	22.0
	• Corvina, 1983	9,000-11,000	7	8	17,920	24,591,400	28.0
	• Pirauna, 1982	8,000-10,500	7	9	12,470	20,957,600	27.0
	• Sul de Pampo, 1978	9,300- 9,600	...	...	...	...	20.0
	• Cherne, 1982	9,900-10,200	19	23	31,660	39,985,100	27.0
	• Bagre, 1983	8,700- 9,000	8	10	6,010	4,501,400	25.0
	• Parati, 1982	8,900- 9,200	3	5	1,590	4,714,200	25.0
	• Viola, 1981	9,200- 9,900	7	8	6,915	8,050,900	26.0
	• Marimba, 1983	8,900- 9,200	3	5	12,970	5,866,800	28.0
	• Anequim, 1981	8,200- 8,500	3	3	2,540	3,181,400	27.0
	• Area RJS-150	...	...	...	...	296,070	26.0
	• Moreia, 1984	8,200- 9,500	6	6	4,640	1,716,900	22.0
	• Albacora, 1984	8,430	4	15	2,083	760,500	26.0
RIO GRANDE DO NORTE	Alto do Rodrigues, 1981	990- 1,120	290	302	4,410	5,845,400	18.0
	• Ubarana, 1973	7,216- 8,365	87	89	18,050	47,159,500	40.0
	• Agulha, 1975	5,412	4	4	365	6,380,000	33.0
	Estreito/Rio Panon, 1983	650- 820	441	449	5,600	8,424,100	16.0
	Macau/Terra, 1982	3,000- 3,300	2	12	150	712,250	31.0
	Lorena, 1984	1,200- 1,700	18	20	890	593,500	28.0
	Upanema, 1985	1,110- 1,800	16	24	1,700	1,574,000	28.0
	• Area 1-RNS-36, 1982	...	...	...	...	178,290	32.0
	• Macau-Mar, 1986	3,000	5	5	200	372,750	31.0
	Faz. Pocinho, 1982	1,450- 2,000	191	202	4,705	8,669,700	35.0
	Palmeiras, 1982	1,450- 1,800	...	...	...	...	25.0
	Serraria, 1982	3,200- 3,900	36	37	1,625	2,298,500	27.0
	Guamaré, 1983	1,400- 1,600	32	36	600	1,435,400	25.0
	Canto do Amaro, 1986	2,500- 3,600	114	128	6,015	2,550,700	25.0
	Livramento, 1986	2,500- 3,300	31	33	5,100	2,324,100	41.0
	Other	...	81	96	200	419,000	...
PARÁ	• Area 1-PAS-11, 1983	...	...	...	...	421,300	41.0
MARANHÃO	São João, 1983	4,950- 6,200	4	5	30	72,060	40.0
SERGIPE	Atalaia Sul, 1961	1,450	5	7	100	2,679,500	24.0
	Carmopolis, 1963	2,460	771	798	23,700	161,371,000	24.0
	Riachuelo, 1961	1,475	239	245	3,840	20,501,800	28.0
	Siririzinho, 1967	1,640	187	196	5,790	34,408,000	30.0
	• Caioba, 1969	6,232- 6,890	12	12	2,490	29,573,700	36.0
	• Camurim, 1970	6,232	48	50	5,000	15,359,200	25.0
	• Dourado, 1970	3,620- 3,635	5	5	1,010	3,955,000	36.0
	• Guaricema, 1968	3,335- 4,430	12	12	4,480	35,025,500	41.0
	• Robalo, 1973	3,300- 4,500	4	5	130	818,600	30.0
	Brejo Grande, 1967	1,670	12	13	625	1,735,200	26.0
	Other	...	88	93	1,420	3,506,080	...
	Total Brazil		**5,909**	**6,277**	**556,268**	**2,310,047,860**	

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
BRUNEI	SHELL	• Fairley, 1969	10,740	37	54	13,157	107,200,000	40.0
		• Ampa SW, 1963	7,068- 8,155	98	219	43,694	515,500,000	41.0
		• Magpie, 1975		16	23	17,718	66,900,000	31.0
		• Champion, 1970	4,300	106	210	39,846	285,800,000	23.0
		Seria, 1929		346	585	20,277	973,300,000	34.0
		Rasau, 1929		5	9	4,508	4,100,000	30.0
		Other					13,000,000	
		Total Brunei		**608**	**1,100**	**139,200**	**1,965,800,000**	
BURMA[e]	MYANMA	Chauk-Lanywa, 1902	1,500- 4,000					36.0
		Mann, 1970	1,600- 7,000					37.5
		Myanaung, 1964	2,000- 4,000	450	450	19,000	489,685,000	40.5
		Prome, 1965	850- 5,000					36.0
		Yenangyaung, 1902	100- 6,700					36.0
		Total Burma		**450**	**450**	**19,000**	**489,658,000**	
CAMEROON	ELF[e]	• Betika, 1972	5,300					42.5
		Ekoundou S., 1975	6,200					24.0
		Kole, 1974	5,500					31.0
		Kombo Center, 1976	5,900					37.0
		Kombo North, 1978	7,200					35.0
		Ekoundou Horst plus Center, 1972	7,200					29.0
		Boa, 1976	5,900					35.0
		Bavo South, 1976	5,600					29.3
		Betika S. Marine, 1979	6,300	16	170	167,619	364,898,935	30.0
		Ekuondou N. Marine, 1977	5,250					36.0
		Mokoko NF plus Abana, 1977	4,600					29.0
		Asoma Marine, 1973	3,600					19.0
		Kita E. Marine, 1978	6,900					40.8
		Mokoko S. Marine, 1977	3,300					17.0
		Inova Marine, 1976	6,200					32.8
	TOTAL-CFP	• Moudi, 1979	5,250- 5,900	4	4	4,088	9,632,140	40.0
		• Moudi D., 1980	3,300	5	5	2,293	2,336,836	21.3
		Total Cameroon		**175**	**179**	**174,000**	**376,867,911**	
CANADA	ALBERTA	Acheson, 1950	3,390	62	118	12,986	120,066,226	38.0
		Bantry, 1940	2,574- 3,300	150	184	6,647	46,537,461	
		Bellshill Lake, 1955	2,950	419	432	12,980	58,646,234	
		Bonnie Glen, 1952	3,959- 6,779	144	170	23,229	496,104,770	34.0-44.0
		Carson Creek N., 1958	8,787- 8,935	41	74	9,967	136,947,486	44.0
		Cessford, 1950	2,800- 3,028	196	272	3,523	29,739,639	
		Clive, 1951	6,074- 6,208	120	169	5,436	49,182,090	
		Countess, 1951	2,858- 4,272	116	148	7,258	61,650,607	
		Fenn-Big Valley, 1950	3,900- 5,400	145	318	18,300	312,219,206	32.0
		Gilby, 1962	4,201- 7,000	85	155	3,116	46,423,510	
		Golden Spike, 1949	3,570- 5,961	69	84	2,371	180,961,066	36.0
		Harmattan East		87	149	4,131	70,926,216	
		Harmatton Elkton, 1955	8,796-10,757	62	76	4,581	60,444,189	
		Innisfail, 1956	6,730- 8,440	33	74	5,752	73,761,997	
		Joarcam, 1949	3,179	204	288	5,382	100,259,782	
		Joffre, 1953	4,983- 6,779	88	167	3,892	81,882,361	
		Judy Creek, 1951	8,307- 8,701	190	266	18,915	388,265,226	43.0
		Kaybob, 1957	4,870- 9,577	56	88	5,856	100,629,149	
		Kaybob S., 1958	5,600-10,042	71	100	9,592	76,445,982	
		Leduc-Woodbend, 1947	3,062- 5,380	348	737	4,604	375,198,288	40.0
		Lloydminster, 1933	1,690- 1,945	500	836	5,863	47,200,642	
		Medicine River, 1954	5,435- 7,600	246	347	10,220	67,323,063	
		Mitsue, 1964	5,908	250	386	25,401	271,263,665	43.0
		Nipisi, 1965	5,648- 5,726	244	340	31,912	263,581,751	41.0
		Pembina, 1953	3,000- 6,133	3,315	4,055	93,541	1,204,156,195	32.0-37.0
		Provost, 1946	2,760- 2,898	949	1,308	17,938	70,388,031	
		Rainbow, 1965	4,994- 6,160	261	339	48,992	497,656,724	38.0-42.0
		Rainbow South, 1965	6,102- 6,400	50	81	7,029	62,063,923	
		Red Earth, 1956	4,184- 4,878	174	259	4,942	36,024,951	
		Redwater, 1948	2,012- 3,200	587	848	15,145	784,068,674	35.0
		Simonette, 1958	10,500	33	46	2,460	37,367,554	
		Snipe Lake, 1962	8,500	48	95	3,785	52,574,155	
		Sturgeon Lake S., 1953	4,912- 8,471	92	146	15,992	137,010,616	37.0
		Sundre, 1954	8,700- 9,000	54	69	3,182	35,791,800	
		Swan Hills, 1957	8,100	589	820	40,545	667,109,678	40.0
		Swan Hills S., 1959	8,400	178	198	18,009	338,479,554	
		Turner Valley, 1913	3,100- 9,150	101	158	2,655	138,926,474	39.0
		Utikuma Lake, 1963	5,624	104	138	4,461	43,380,838	
		Virginia Hills, 1957	9,210	126	183	16,958	141,966,553	34.0
		Wainwright, 1925	1,903- 2,200	617	760	9,684	65,562,771	
		Westerose, 1952	6,818	28	35	15,048	125,517,746	
		Willisden Green, 1956	5,157	572	797	9,416	114,056,076	
		Wizard Lake, 1951	4,044- 5,973	38	48	14,372	318,444,912	

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Zama	3,702	136	242	5,914	73,391,284	33.0-37.0
		Other	...	8,770	13,103	358,948	1,501,088,849	...
	BRITISH COLUMBIA	Boundary Lake, 1957	3,418- 4,575	287	348	11,171	167,805,481	40.0
		Other	...	391	829	24,749	253,385,577	...
	MANITOBA	All fields	...	1,434	1,624	13,479	161,286,112	...
	SASKATCHEWAN	Steelman, 1950	4,600	660	721	9,188	251,994,739	...
		Weyburn, 1955	4,600	809	878	17,793	280,897,407	...
		Other	...	12,378	16,144	180,528	1,647,494,821	...
	ONTARIO	All fields	...	1,175	1,494	2,293	61,049,607	...
	NEW BRUNSWICK	All fields	...	...	...	9	802,951	...
	NORTHWEST TERRITORIES	All fields	...	...	...	26,413	54,571,770	...
		Total Canada		**37,882**	**51,744**	**1,236,553**	**12,839,976,429**	
CHILE	ENAP-MAINLAND	Canadon, 1962	6,090	13	63	236	14,468,812	38.4
		Daniel, 1960	5,806	4	119	165	34,434,471	25.4
		Daniel Este, 1961	5,523	5	64	490	28,311,574	25.0
		Dungeness, 1962	5,251	3	19	107	3,915,136	28.6
		Posesion, 1960	5,622	33	75	838	21,176,251	63.6
		Other	...	22	120	2,336	22,192,977	...
	TIERRA DEL FUEGO	Calafate, 1955	6,045	13	61	1,008	25,561,355	49.3
		Catalina Sur, 1961	5,779	4	43	25	6,360,443	44.0
		Cullen, 1954	5,730	16	107	382	40,980,042	41.8
		Tres Lagos, 1957	5,724	18	84	366	15,826,176	40.1
		Catalina, 1956	5,756	10	26	1,788	6,204,654	38.7
		Gorrion, 1986	6,025	6	6	947	375,381	39.0
		San Sebastián Norte, 1986	6,870	4	4	227	87,726	37.0
		Other	...	33	255	1,538	57,773,725	...
	STRAIT OF MAGELLAN	Ostion, 1977	7,156	15	18	1,468	7,724,254	33.0
		Posesion, 1977	6,727	12	39	1,102	5,169,663	34.5
		Spiteful, 1977	6,298	35	82	5,036	41,014,552	34.5
		Spiteful Norte, 1978	7,150	13	55	799	3,213,168	39.0
		Daniel Este-Dungeness, 1977	6,126	28	36	3,140	3,423,262	35.9
		Pejerrey, 1984	7,229	36	75	7,855	8,274,097	39.0
		Jaiba, 1978	6,650	2	2	871	25,251	46.5
		Total Chile		**325**	**1,353**	**30,724**	**352,512,970**	
CHINA[e]	WESTERN REGION: JUNGGAR BASIN, TARIM BASIN, TURPEN BASIN	Karamay, 1955	...	...	...			...
		Dushanzi, 1941	...	...	...			...
		Other	...	...	...			...
	CENTRAL REGION: JIUQUAN BASIN	Yumen, 1938	...	...	...			...
	CENTRAL REGION: SICHUAN BASIN	All fields	...	...	...			...
	CENTRAL REGION: SHAN-GAN-NING BASIN	Chang Qing, 1978	...	...	...			...
		Yanchang, 1907	...	...	...			...
	CENTRAL REGION: QAIDAM BASIN	Qinghai, 1955	...	...	...			...
		Lenghu 3,4,5, 1958	...	...	...			...
		Other	...	...	...			...
	EASTERN REGION: SONGLIAO BASIN	Daqing, 1959	...	39,500	NA	2,682,000	12,695,513,000	...
		Fuyn, 1958	...	...	...			...
		Jilin, 1978	...	...	...			...
	EASTERN REGION: BOHAI BASIN	Shengli, 1962	...	...	...			...
		Renqiu, 1975	...	...	...			...
		Liaohe, 1964	...	...	...			...
		Dagang, 1964	...	...	...			...
		Zhongyuan, 1981	...	...	...			...
		Itu, 1970	...	...	...			...
	EASTERN REGION: JIANGHAN BASIN	Qianjiang, 1966	...	...	...			...
		Other	...	...	...			...
	EASTERN REGION: NANXIANG BASIN	Nanyang, 1971	...	...	...			...
	EASTERN REGION: SUBEI BASIN	All fields	...	...	...			...
		Total China		**39,500**	**NA**	**2,682,000**	**12,695,513,000**	
CHINA TAIWAN	CHINESE PETROLEUM	Tiechengshan,[c] 1959	...	25	33	1,060	15,306,500	51.0
		Chingtsohu,[c] 1967	...	5	18	48		50.0
		Yunghoshan,[c] 1971	...	23	33	270	6,301,067	45.0
		Chuhuangkeng,[c] 1960	...	24	26	146		50.0
		• CBK,[c] 1986	...	4	9	1,089	417,981	47.0
		Total China, Taiwan		**81**	**119**	**2,613**	**22,025,548**	

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Mbl	°API gravity
COLOMBIA	ECOPETROL[e]	Galán, 1945	3,200	62	71			19.0
		Infantas, 1918	3,200	263	307			25.8
		La Cira, 1925	3,250	612	703			24.0
		Lis-Nutria, 1957	9,500	130	137			31.0
		Llanito, 1960	7,300	60	61			21.0
		Cantagallo, 1941	6,800	11	13			19.7
		Casabe, 1941	3,800	330	416			20.7
		Yarigui, 1954	8,700	58	59			19.5
		Boquete, 1961	8,000	12	20			43.0
		Cicuco, 1956	...	5	22	76,988	1,954,497,703	...
		Petrolea, 1933	...	6	21			...
		Tibu, 1940	...	189	261			...
		Ortega, 1951	...	6	6			28.0
		Apiay, 1981	10,500	9	22			23.0
		Orito, 1963	6,600	58	95			40.0
		Other	...	129	215			...
	SHELL[e]	Sta. Rosa, 1984	...	1	1			...
	ARGOSY	Bourdine, 1974	11,000	2	4	679	3,069,634	26.7
		Máxime, 1976	11,000	1	1	2	111,911	11.0
		Nancy, 1974	11,000	1	1	312	1,880,073	26.0
	ESSO COLOMBIANA LTD.	Bonanza, 1963	4,000	17	17	858	12,727,667	30.0
		Provincia, 1962	8,000	98	98	15,059	156,221,504	33.0
		Arauca, 1980	18,000	3	3	2,210	4,473,706	41.0
		Other	...	...	...	...	667,000	...
	HOCOL (TENNECO)	Dina K, 1969	6,500	23	30	8,632	26,702,576	22.0
		Dina T, 1962	3,600	47	58	4,965	19,933,643	20.0
		Palogrande, 1971	6,500	24	32	7,802	16,533,954	20.0
		Cebu, 1981	6,500	8	10	2,240	4,348,329	19.0
		Brisas, 1973	4,200	4	5	797	4,494,143	23.5
		Pijao, 1981	7,000	6	7	734	3,483,747	21.0
		Hato Nuevo, 1984	6,900	3	4	545	1,421,601	36.0
		Tello, 1972	7,500	27	33	7,447	38,818,837	22.0
		La Canada, 1966	700	5	7	133	1,051,654	22.0
		San Francisco, 1985	2,800	33	35	13,286	9,844,179	27.0
		Tenay, 1985	11,500	2	2	2,180	1,403,466	36.3
		Loma Larga, 1985	3,500	1	1	44	24,857	22.4
		La Jagua, 1986	5,300	1	1	141	128,625	22.0
		Santa Clara, 1987	2,100	1	1	163	14,350	19.0
	ELF	Trinidad, 1974	9,000	3	3	2,678	2,980,624	32.4
		Barquerena, 1982	9,300	2	2	1,879	2,382,765	32.3
		Cano Garza Norte, 1983	7,900	2	2	798	1,366,054	40.2
		Cano Garza, 1979	7,900	3	3	560	929,196	40.2
		Tocaria, 1980	13,500	2	2	829	648,661	32.1
		Cravo Sur, 1982	10,600	2	2	2,056	1,790,917	40.2
		Gloria Norte, 1983	12,100	1	2	632	551,144	17.2
		Cravo Este, 1987	11,376	1	1	10	3,481	42.0
	OCCIDENTAL	Payoa, 1962	8,000	24	39	1,067	69 319,875	27.0
		La Salina, 1936	2,500	49	71	2,868	12,438,352	28.0
		Caño Limón, 1983	7,600	36	38	182,875	107,566,248	29.4
		Redondo, 1984	7,600	3	3	9,410	291,708	30.2
	TEXACO	Cocorna, 1963	2,100	44	54	2,392	13,171,138	12.0-13.0
		Tisquirama, 1963	8,000	5	6	467	4,668,322	16.0-28.0
		Velasquez, 1946	7,500	119	144	4,130	164,756,697	19.0-24.0
	TEXACO-ECOPETROL	Teca, 1981	2,100	139	154	13,768	19,649,607	12.0-13.0
		Nare, 1981	2,100	4	6	152	237 107	11.0-12.0
		Los Angeles, 1983	6,400	2	4	464	350,905	14.0-15.0
		Other	...	3	20	41	4,260,355	11.2-26.1
	CHEVRON	Castilla, 1969	6,500	17	18	11,250	20,395,052	13.5
		Chichimene, 1969	6,500	1	1	557	393,556	21.3
	LASMO	Santiago, 1985	9,600	2	2	1,200	693,000	29.0
		Total Colombia		**2,711**	**2,436**	**385,300**	**2,692,832,415**	
CONGO	AGIP	• Loango, 1972	3,000	52	62	23,960	81,500,000	26.8
	ELF CONGO	• Emeraude, 1969	820	93	98	22,000	160,000,000	22.3
		• Likouala, 1972	4,270	28	42	17,800	51,000,000	33.1
		• Yanga, 1979	2,950	48	63	20,700	62,000,000	29.4
		• Sendji, 1973	3,940	49	75	34,900	44,000,000	29.5
		Pointe Indienne, 1959	4,460	3	3	180	7,000,000	36.9
		Mengo, 1979	6,500	3	3	180	600 000	34.0
		Kunsi, 1983	4,000	2	2	130	500,000	35.8
		• Tchibouela, 1983	2,100	11	12	3,200	1,100,000	28.0
		Total Congo		**289**	**380**	**123,000**	**407,700,000**	

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
DENMARK	DUC	• Dan, 1971	6,000- 6,400	...	...	21,236	38,584,436	30.7
		• Gorm, 1971	6,500- 7,000	...	...	25,842	67,044,548	34.7
		• Skjold, 1977	5,000	...	...	20,897	26,503,654	29.6
		• Rolf, 1981	...	...	...	10,923	6,935,733	37.7
		• Tyra,[c] 1986	...	...	...	14,523	11,510,668	56.6
		Total Denmark		...	...	**93,421**	**150,579,039**	
DUBAI[e]	DUPETCO	• Fateh, 1966	7,900- 9,000					31.8
		• S.W. Fateh, 1970	7,500- 9,000					30.3
		• Falah, 1972	8,100	141	156	377,600	1,922,775,000	25.5
		• Rashid, 1973	9,400-11,500					38.0
	ARCO	Margham, 1981	11,200	9	14			43.5
		Total Dubai		**150**	**170**	**377,600**	**1,922,775,000**	
ECUADOR	TEXACO-CEPE	Lago Agrio, 1967	9,600- 9,900	20	35	4,605	107,874,969	28.5
		Sacha, 1969	8,700- 9,800	91	101	34,440	337,853,986	28.0
		Shushufindi, 1969	8,800- 9,200	48	61	66,322	494,732,056	30.0
		Aguarico, 1969	9,000- 9,300	4	10	3,286	42,352,887	27.2
		Auca, 1970	8,900-10,100	21	23	8,842	64,868,855	28.0
		Auca Sur, 1980	9,100-10,300	2	2	453	1,138,109	25.6
		Atacapi, 1968	9,200- 9,500	4	5	774	11,567,397	31.0
		Parahuacu, 1968	8,700- 9,600	1	5	503	6,036,575	30.0
		Yuca, 1970	9,500- 9,900	5	7	1,965	10,192,208	25.2
		Yuca Sur, 1979	9,600-10,000	1	1	70	880,500	14.5
		Yulebra, 1980	8,800-10,000	2	2	964	2,193,240	24.3
		Culebra, 1973	8,800-10,000	2	2	418	1,707,251	15.2
		Cononaco, 1972	9,700-10,200	11	11	8,149	20,743,356	33.3
		Dureno, 1969	8,900-10,000	1	1	373	666,428	31.0
		Guanta, 1986	8,900- 9,900	9	9	3,499	1,855,863	29.0
		Rumiyacu, 1982	10,100-10,600	...	1	...	184,939	28.7
	CLYDE PETROLEUM	Mariann, 1971	7,700	5	5	456	3,515,214	20.0
		Fanny, 1972	7,700	8	8	2,650	9,319,890	22.5
		Tarapoa, 1973	8,300	2	2	212	919,579	20.0
	CEPE-ORIENTE[e]	Shushuqui, 1980	9,200	6	6			28.8
		Shuara, 1980	9,100	8	8			29.6
		Secoya, 1980	9,100	15	15			30.3
		Charapa, 1967	10,000	12	12	36,719	177,633,235	30.0
		Cuyabeno, 1972	8,050	4	4			28.8
		Sansahuari, 1979	8,100	1	1			28.8
		Tetete, 1980	9,300	5	5			28.0
		Bermejo, 1967	5,000	9	9			34.0
	CEPE-PENINSULA[e]	Ancon, 1921	4,000	475	475			35.6
		Carpet	...	70	70			...
		Cautivo	...	100	100			...
		Total Ecuador		**942**	**996**	**174,700**	**1,296,236,537**	
EGYPT	GUPCO/AMOCO	• El Morgan, 1965	5,100- 6,400	89	112	119,412	1,010,500,000	27.0-32.0
		• July, 1973	8,100-10,000	37	44	78,928	451,000,000	31.0-34.6
		• Ramadan, 1974	11,300	23	25	42,507	362,100,000	31.7
		• October, 1978	11,000	23	27	123,102	298,800,000	28.0
		• Shoab Ali, 1978	5,500	15	47	13,865	126,200,000	30.0
		• SG-300, 1976	5,876	1	2	2,326	17,700,000	24.8
		• Sidki (382), 1977	10,500	5	7	7,542	38,200,000	33.9
		• GS (365) 1980	10,140	...	1	...	490,000	32.0
		• GS (277), 1980	8,610	1	1	877	2,200,000	34.0
		• SB (305), 1981	8,100	1	1	585	2,020,000	30.0
		• Badri (315), 1981	6,400	16	35	38,735	42,700,000	27.0
		• Younis (347), 1981	4,300	4	5	6,870	11,980,000	32.0
		• GH (376), 1981	8,600	2	5	3,184	5,800,000	25.0
		• SB (339), 1981	4,600	1	1	626	571,000	29.5
		• Nessim (336), 1981	6,700	2	2	865	8,700,000	26.9
		• Hilal (404), 1982	9,200-10,000	5	6	29,869	36,100,000	32.0
		• Waly (356), 1982	6,900	3	3	976	2,980,000	32.0
		• GS (345/346), 1982	7,500	1	2	131	1,130,000	38.0
		• SB (367), 1984	7,000	1	1	455	1,180,000	38.0
		• GS (381), 1985	8,700	...	1	...	920,000	37.0
		Abu Gharadig, 1972	9,500	18	25	11,951	50,390,000	36.0
		WD-33, 1972	9,800-10,800	1	1	56	2,110,000	32.0
		Razzak and E. Razzak, 1972	7,000	9	17	3,475	50,940,000	36.0
		• GS-327, 1983	5,600	1	1	3,202	1,500,000	20.0
		• SB-294, 1986	11,600	1	1	1,099	692,000	30.5
		NAG-9/9-1, 1985	10,000	2	2	1,318	986,000	35.0
		NEAG-9/15, 1984	10,635-12,128	1	1	194	203,000	35.0
		WD-33/15, 1985	5,800	2	2	1,863	683,000	30.0
	AGIP	• Belayim Marine, 1961	9,100	55	65	133,493	557,392,209	29.0
		Belayim Land + Minori, 1954	8,500	96	103	40,613	413,674,357	21.5
		Meleiha, 1972	5,950	21	23	11,263	5,157,963	41.6

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	WEPCO/PHILLIPS PETROLEUM	El Alamein, 1966	8,700	17	19	1,822	66,182,919	33.6
		Umbarka, 1976	10,700	4	5	2,580	5,713,603	43.9
		Yidma, 1971	9,000	3	5	1,185	21,760,274	44.0
	OSOCO/TOTAL	• Shukheir Bay, 1978	6,300	1	1	467	1,916,875	34.5
		• S. Ramadan, 1982	10,000	2	2	886	723,666	36.5
	GEYSUM	• Geysum, 1980	5,500	5	5	...	...	17.0
	SUESSO (ESSO)	• East Zeit, 1982	11,000	6	6	15,730	9,065,353	38.0
	KHALDA	Salam, 1983	9,000	19	22			43.0
		Khalda, 1983	7,000	5	6			43.0
		Hayat, 1986	9,000	3	3	20,228	7,405,340	43.0
		Safir, 1986	12,000	1	1			43.0
		Tut, 1986	9,000	1	1			43.0
		Safir North, 1986	11,600	2	2			...
	BADR PETROLEUM/SHELL	Badr el din, 1982	10,800	9	9	11,040	15,730,000	38.0
	EGPC[e]	Gharib, 1938	2,200- 4,500	81	215			24.3
		Bakr/W. Bakr, 1958/1978	3,200- 1,500	48	83			18.0-19.0
		Umel Yusr, 1968	3,000- 3,300	19	37			21.5
		Amer, 1965	3,500	21	39			21.5
		El Ayoun, 1968	3,300	5	12			22.0
		Kareem, 1958	2,300	6	35			16.6
		Kheir, 1973	1,050	1	4			28.5
		Shukheir, 1966	2,500	5	11			34.0
		Ras El Behar, 1983	4,500	6	11			32.5
		Esh Elmalaha	3,700	2	2			44.0
		Sudr, 1946	2,600	12	20			21.6
		Asl, 1947	3,000	3	6			21.6
		Matarma, 1948	2,000	2	2	162,680	691,653,441	14.6
		El Khaligue, 1980	1,600	...	1			29.4
		Abu Senan T&Y, 1981	6,000	12	20			...
		Harghada, 1913	...	NA	NA			...
	SUCO[e]	• Ras Budran, 1978	11,400	16	16			25.0
		• LL 87-2, 1975	11,000	...	1			35.0
		• Ras Fanar, 1978	2,300	6	6			35.0
		• Zeit Bay, 1981	4,200	22	22			33.0
	EPEDECO[e]	West Bakr, 1978	1,300- 1,500	20	25			18.0
	EGYPTCO[e]	Meleha, 1972	6,000	12	12			40.0
	SHUKAIR MARINE CO.[e]	O. Suco	...	1	1			...
	EL ALAMEIN[e]	Mors	...	1	1			...
		Total Egypt		**821**	**1,244**	**896,000**	**4,325,151,000**	
FRANCE	ALSACE	All fields	...	18	11	347	2,929,089	...
		Abandoned	...	...	...	...	24,337,343	...
	AQUITAINE BASIN	Lacq Superieur, 1949	2,170	42	27	904	25,563,610	22.3
		Parentis, 1954	7,710	58	45	5,553	196,115,891	33.4
		Lugos, 1956	5,250	21	5	732	9,933,193	20.8
		Cazaux, 1959	7,550	36	35	4,381	67,779,650	34.2-37.0
		Lavergne, 1962	11,480	4	2	389	12,146,393	41.7
		Pecorade, 1974	10,660	10	10	2,470	9,041,862	29.3
		Castera-Lou, 1976	9,600	8	3	427	2,330,489	21.7
		Vic Bilh, 1979	7,100	30	15	5,775	14,742,496	26.6
		Lagrave, 1984	6,500	3	...	4,152	4,061,327	42.5
		Other	...	7	5	244	10,231,603	...
		Abandoned	...	...	...	...	8,848,691	...
	PARIS BASIN	Coulommes, 1958	6,230	31	18	391	13,213,378	32.6
		Châteaurenard, 1958	1,800	25	22	354	4,734,307	27.5
		St. Martin, 1959	4,590	12	4	320	8,351,063	33.0
		Villeperdue, 1959	6,100	93	27	14,594	11,434,528	34.4
		St. Firmin, 1960	1,800	34	28	513	9,799,700	27.5
		Chuelles, 1961	1,800	35	33	453	6,857,012	27.5
		Soudron, 1976	4,600	20	10	446	1,925,558	34.4
		Donnemarie, 1979	8,040	2	5	800	1,828,126	36.2
		Chaunoy, 1983	7,350	43	20	15,767	16,141,341	37.1
		St. Germain, 1984	7,200	7	5	1,103	1,433,088	36.0
		Vert-le-Grand, 1986	6,230	4	...	1,288	494,891	34.8
		Other	...	82	86	3,781	12,605,903	...
		Abandoned	...	...	...	...	13,476,998	...
	SOUTHEAST + JURA	Abandoned	...	...	...	...	223,063	...
		Total France		**625**	**416**	**65,184**	**490,580,593**	
GABON	ELF[e]	• Anguille, 1962	9,200					31.2
		• Anguille NE, 1968	7,500					32.0
		• Anguille NNE, 1971	7,500					32.0
		• Barbier, 1972	6,000					29.5
		• Breme, 1976	5,000					36.5

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Clairette, 1956	4,400					29.0
		• Girelle, 1973	9,400					32.0
		• Gonelle, 1972	5,800					24.2
		• Grondin, 1971	7,500					16.4
		• Mandaros, 1972	4,900					19.8
		Olende, 1976	6,700					33.8
		• P.G.S. Marine, 1975	7,500	214	330	113,323	906,840,000	32.5
		• Port Gentil Ocean, 1964	6,500					33.0
		Tchengue, 1957	4,100					26.8
		• Torpille, 1968	8,200					35.8
		• Baliste, 1974	4,900					28.3
		• M'Bya Sud, 1969	6,700					35.4
		• Anguille SE, 1962	8,200					32.8
		• Ayol Marine, 1979	7,700					22.8
		• Baudroie N., 1980	7,500					34.5
		• Baudroie Marine, 1968	7,500					33.3
		Other	...					...
	SHELL GABON	Gamba/Ivinga, 1963	3,000- 3,100	50	84	12,800	254,472,000	31.6
		Lucina-Marine, 1971	5,900	14	22	9,620	48,311,000	38.4
		Lucina-Marine W., 1982	NA	...	...	1,220	1,645,000	37.0
	AMOCO	Oguendjo B and C, 1981	5,000- 6,000	15	15	12,907	27,656,000	36.0
	TENNECO	• Pelican, 1985	9,300	3	3	4,980	1,818,000	31.0
		• Octopus, 1984	10,300	3	3	1,150	420,000	33.0
		• Obando, 1984	8,650	...	1	...	...	32.0
		Total Gabon		**299**	**458**	**156,000**	**1,241,162,000**	
GHANA[e]	AGIP-PETCO	• Saltpond, 1977	8,500	...	3	...	3,938,000	36.0-39.0
		Total Ghana		...	**3**	...	**3,938,000**	
GREECE[e]	N. AEGEAN PET. CORP.	• Prinos, 1974	8,000- 8,800	16	16	22,500	52,325,000	30.6
		Total Greece		**16**	**16**	**22,500**	**52,325,000**	
GUATEMALA		Rubelsanto, 1974	5,300- 7,000	7	7	1,061	5,345,739	26.0-30.0
		West Chinaja, 1977	3,200- 3,800	3	3	924	6,795,954	35.0-43.0
		Caribe, 1981	6,830- 7,280	3	3	1,600	3,185,709	22.0-24.0
		Tortugas	2,300	...	...	...	67,804	35.0
		Tierra Blanca	11,230	...	...	...	175,113	19.5
		San Diego, 1981	17,150	1	1	105	120,953	34.7
		Xan, 1985	...	1	1	...	60,082	17.5
		Total Guatemala		**15**	**15**	**3,690**	**15,752,354**	
INDIA	GUJARAT STATE	Ankleshwar, 1960	1,969- 6,564	114	198	23,917	409,840,000	44.0-51.0
		Kalol, 1961	4,595-10,830	114	204	6,254	36,663,000	38.0
		Sanand, 1962	4,267-10,174	21	40	2,408	8,047,000	26.0
		Nawagam, 1963	4,595-10,174	71	110	2,690	23,440,000	31.0
		Kadi, N., 1968	3,610- 7,220	152	201	13,882	42,780,000	21.0
		Kadi, S., 1968	6,892- 9,846	3	13	448	3,210,000	24.0
		Sobhasan, 1968	4,595- 9,846	59	88	6,290	17,236,000	26.0-40.0
		Viraj, 1978	4,595- 4,923	7	24	1,468	2,776,000	20.0
		Gandhar, 1984	9,486-12,145	9	21	2,950	1,106,000	47.0
	ASSAM STATE	Rudrasagar, 1960	7,877-13,128	44	71	9,124	28,457,000	25.0
		Lakwa-Lakhmani, 1964	6,564-14,113	176	260	34,292	120,488,000	33.0
		Geleki, 1968	9-518-14,769	74	127	7,628	22,536,000	30.0
	NAGALAND	Changpang, 1973	8,861-10,502	7	12	1,721	2,690,000	34.0
	TAMIL NADU	Narimanam, 1985	6,236- 7,549	2	3	152	87,000	29.0-45.0
	WEST COAST	Bombay High, 1974	3,282- 7,877	205	323	362,462	885,306,000	39.0
		Panna (North Bassein), 1976	4,923- 7,549	5	11	998	325,000	38.0
	OTHER FIELDS[e]	Wavel, 1962	4,595- 7,220					
		Kosamba, 1963	1,313- 8,533					
		Kholka, 1966	4,365- 5,577					
		Bakrol, 1966	2,626- 9,846	1,573	1,652	104,054	365,560,000	...
		Kathana, 1965	5,250- 5,906					
		Digboi, 1980	300- 7,500					
		Moran, 1958	11,000					
		Nakhonkatiya, 1953	9,400					
		Total India		**2,670**	**3,413**	**609,000**	**2,002,164,000**	
INDONESIA	PERTAMINA UEP I[e]	Besitang, 1977	3,973					51.5
		Gebang, 1977	2,917					54.0
		K. Simpang, 1971	3,740- 5,019					45.0
		P. Tabuhan, 1937	3,350- 5,893	204	226			50.8

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Rintau, 1929	2,764					45.3
	Selang Jaya, 1926	3,701					47.5
PERTAMINA UEP II[e]	Benuang, 1942	6,103					35.1
	Benakat East, 1973	NA					NA
	Tempino, 1931	1,647					23.0
	Gn. Kemala, 1938	5,448					38.0
	Limau, 1978	3,896- 4,626					NA
	Ogan Timur, 1943	3,793					27.42
	Talang Jimar, 1937	4,123	412	1,419			31.0
	T. Miring, 1935	640					NA
	Tanjung Tiga, 1938	3,750					28.0
	Kenali Asam, 1931	2,077					29.0
	Belimbing	5,371					...
	Kuang, 1940	5,249					25.1
PERTAMINA UEP III[e]	Cemara, 1976	3,964- 7,104					...
	Jatibarang, 1969	3,063	88	184			29.0
	Tugu Barat, 1979	3,014					...
PERTAMINA UEP IV[e]	Bunyu, 1923	2,077					33.2
	Sangatta, 1939	1,842					33.0
	Tanjung, 1938	2,296	161	334	69,668	2,928,974,192	39.9
	Tapian Timur, 1967	4,396					38.8
	Warukin S., 1966	2,067					26.9
PERTAMINA UEP V[e]	Klamono, 1936	574					19.0
	Linda, 1977	3,281	47	55			19.0
	Sele, 1951	2,156					35.0
PERTAMINA (FROM STANVAC)[e]	Sago, 1940	1,800					34.0
	Lirik, 1939	1,600					34.0
	Molek, 1956	2,600					34.0
	N. Pulai, 1941	1,800					34.0
	S. Pulai, 1941	1,800	354	354			34.0
	Talang Akar, 1922	2,800					35.0
	Benakat, 1932	1,600					35.0
	Jirah, 1930	2,300					35.0
	Rajah, 1940	6,000					38.0
	Abab, 1951	6,000					36.0
PERTAMINA (N.E. KALIMANTAN)[e]	Sembakung, 1976	2,600	17	19			36.0
	Bangkudulis, 1980	3,250	...	1			39.5
PERTAMINA (FROM PHILLIPS)[e]	Salawati, 1976	5,749	7	13			39.2
LEMIGAS[e]	All fields, 1893-1909	2,155- 2,297	71	419			...
ARCO[e]	Ardjuna, 1969	2,380- 7,250	266	330			37.0
	Arimbi, 1972	2,943	10	12			33.0
CER	Bula, 1897	280- 1,300	61	70	1,299	14,632,000	23.0
CAL ASIATIC	Batang, 1975	690	12	20	310	916,000	19.2
	Buaya, 1978	2,035	...	2	...	96,000	28.0
	Lindai, 1971	1,100	16	18	550	3,022,000	30.7
	Menggala S., 1968	3,765	1	1	480	7,669,000	33.5
	Tanjung Medan, 1976	2,770	2	7	380	890,000	37.6
	Benua, 1978	2,400	19	22	4,930	7,357,000	41.4
	Beruk, 1974	1,750	17	23	5,310	22,080,000	38.0
	Bungsu, 1976	2,050	7	8	750	5,303,000	38.4
	Damar, 1974	4,650	5	6	270	2,225,000	33.5
	Dusun, 1979	2,550	6	7	1,310	2,332,000	42.3
	Gatam, 1977	2,385	3	3	...	314,000	33.5
	Kasikan, 1972	660	18	24	470	2,894,000	27.3
	Beruk NE, 1976	1,800	3	5	90	796,000	40.0
	Osam, 1978	900	4	5	150	384,000	31.8
	Paitan, 1978	2,315	1	1	110	305,000	31.6
	Pedaua, 1973	950	30	31	5,680	32,503,000	33.1
	Pusaka, 1977	2,250	19	23	2,990	5,101,000	34.6
	Sabak, 1974	2,350	14	15	880	8,805,000	35.8
	Terantam, 1973	900	4	4	80	335,000	31.7
	Zamrud, 1975	3,600	53	54	11,460	28,945,000	40.3
	Langgak, 1976	1,380	17	22	640	2,056,000	31.7
ASAMERA (NORTH SUMATRA)	Geudondong, 1965	3,192	...	...	...	...	53.1
	Julu Rayeu, 1968	2,832	9	65	221	12,284,056	50.6
	Ilee Tabeu, 1971	2,721	3	73	47	11,891,664	50.3
	Alur Cimon, 1972	3,098	...	34	...	...	50.8
	Tualang, 1973	2,631	13	75	2,602	29,601,774	49.9
	Peudawa, 1980	3,083	...	30	...	...	48.1
ASAMERA (SOUTH SUMATRA)	Kluang, 1913	2,591	30	88	595	33,674,788	42.6
	Mangunjaya, 1934	2,700	8	110	138	22,980,078	32.0
	Tanjung Laban, 1982	3,590	16	24	5,609	4,567,078	38.1
	Ramba, 1982	3,150	60	65	28,360	35,936,986	37.0
	Rawa, 1985	4,038	...	18	1	57,289	38.7
	Tempino, 1931	4,493	3	17	153	1,259,127	40.9
	Bentayan, 1932	4,446	6	13	825	672,555	22.0
	Panerokan, 1976	4,915	3	8	36	178,846	39.4

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
MAXUS ENERGY	• Cinta, 1970	3,500	36	46	13,158	171,187,861	34.0
	• Gita, 1972	5,000	6	9	1,036	6,452,248	34.5
	• Kitty, 1973	2,700	6	7	1,161	13,615,268	18.0
	• Nora, 1973	3,200	3	5	391	8,667,165	29.0
	• Rama, 1974	3,200	44	75	7,381	88,607,804	31.0
	• Selatan, 1971	4,000	8	19	1,277	20,402,184	19.5
	• Zelda, 1971	7,500	27	43	6,303	34,764,756	33.0
	• Krisna, 1979	4,500	28	41	7,413	57,130,762	37.0
	• Yvonne, 1980	4,500	9	11	4,016	11,317,588	36.0
	• Farida, 1982	8,000	10	22	3,118	10,581,595	32.0
	• Titi, 1982	8,000	...	4	...	1,654,547	33.0
	• Sundari, 1982	4,400	12	15	3,371	9,700,365	25.0
	• Duma, 1983	2,300	3	6	158	657,997	16.0
	• Karmila, 1983	4,800	7	9	10,585	25,813,993	36.0
	Wanda, 1984	4,800	2	5	110	1,549,429	36.0
PETROMEX TREND	Canderawasih, 1976	3,500	11	17	1,268	11,697,058	27.8
	Jaya, 1973	3,050	14	19	1,785	35,366,509	42.0
	Kasim, 1972	3,350	36	49	4,790	45,774,419	38.0
	Walio, 1975	2,750	224	268	17,803	146,754,005	34.2
	Other	...	11	22	1,883	11,882,221	...
CALTEX	Aman, 1974	4,700	10	10	2,343		38.6
	Antara, 1978	1,425	5	5	700		35.9
	Balam SE, 1972	4,500	13	13	671		29.0
	Balam South, 1969	1,600	48	48	8,446		33.4
	Bangko, 1970	1,950	75	85	26,341		33.7
	Batang CPI, 1975	690	6	7	286		19.0
	Bekasap, 1955	2,950	53	60	20,392		33.7
	Bekasap S., 1968	3,900	8	11	736		34.1
	Benar, 1973	2,450	25	26	4,429		33.2
	Cebakan, 1974	4,700	4	4	619		30.2
	Duri, 1941	770	1,073	1,370	80,105		21.9
	Garuk, 1980	4,600	1	2	4		30.6
	Hitam, 1975	5,690	4	5	1,343		38.8
	Intan, 1977	3,350	6	6	864		32.9
	Jorang, 1972	5,500	16	18	9,123		38.0
	Kerang, 1977	3,900	11	13	1,044		38.7
	Kopar, 1974	5,300	13	18	2,582		37.2
	Kotabatak, 1952	5,500	67	113	18,384		28.8
	Kulin, 1970	2,050	55	61	4,843		19.8
	Libo SE, 1973	5,900	24	27	10,328		41.6
	Libo, 1968	6,000	9	10	1,711		34.6
	Lincak, 1981	2,570	4	4	728	6,021,389,337	35.2
	Menggala N., 1968	3,850	14	17	4,136		32.5
	Menggala S. CPI, 1968	3,765	7	8	1,852		33.6
	Minas, 1944	2,600	465	604	254,990		34.7
	Mindal, 1971	3,400	2	3	74		36.5
	Mutiara, 1976	3,500	2	2	36		34.1
	Nella, 1977	5,000	3	3	47		34.5
	Obor, 1978	7,370	1	1	149		39.9
	Pager, 1974	4,300	23	25	6,544		37.5
	Pelita, 1977	6,600	5	5	621		39.0
	Pematang, 1959	3,750	37	43	8,683		31.9
	Pematang Bow, 1969	5,300	5	9	851		33.0
	Pemburu, 1981	2,300	8	9	3,709		35.3
	Perkebunan, 1977	2,300	...	1	...		29.4
	Petani, 1964	4,750	33	34	14,478		32.8
	Petapahan, 1971	4,500	23	28	5,736		28.1
	Pinang, 1971	3,950	19	20	2,355		29.8
	Pinggir, 1972	3,300	5	6	373		34.5
	Pinggir S., 1973	3,300	2	2	56		38.6
	Pudu, 1972	5,950	8	12	1,614		35.3
	Puncak, 1979	2,400	14	14	3,769		35.9
	Pungut, 1951	3,400	27	27	4,850		37.9
	Rangau, 1968	6,100	3	10	104		42.0
	Rantaubais, 1972	1,070	14	16	543		18.3
	Rokiri, 1979	6,100	...	2	...		41.3
	Seruni, 1972	3,000	22	23	4,821		35.3
	Sikladi, 1975	4,340	18	18	2,593		39.8
	Singa, 1977	3,200	1	1	55		31.0
	Sintong, 1971	3,400	19	20	2,005		32.3
	Sintong SE, 1973	4,500	...	1	...		36.1
	Suram, 1971	1,750	4	6	252		27.7
	Tandun, 1969	3,000	9	9	740		33.2
	Telinga, 1975	4,205	7	8	925		33.3
	Topaz, 1977	5,200	7	7	1,992		33.2
	Topi, 1979	3,630	1	1	63		36.7
	Tunas, 1983	4,819	2	2	370		35.0
	Ubi, 1976	4,350	20	21	1,584		35.1
	Waduk, 1982	6,100	10	11	324		37.6
STANVAC (CENTRAL SUMATRA)	Binio, 1972	1,600	20	21	454	11,677,943	34.0
	Pekan, 1976	3,700	22	22	795	7,573,274	35.0

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Merbau, 1979	2,700	26	26	1,299	6,334,383	36.0
	Kerumutan, 1980	3,000	22	23	1,163	4,711,496	35.0
	N. Merbau, 1980	2,600	8	9	272	2,750,090	36.0
	Panduk, 1981	2,500	6	6	228	1,401,271	46.0
	Kayuara, 1982	3,700	9	10	559	1,878,810	35.0
	Gemuruh, 1983	2,800	17	17	1,505	1,928,259	34.0
	E. Kayuara, 1983	3,500	45	49	5,698	5,238,225	35.0
	Mutiara, 1985	2,700	2	2	79	97,163	34.0
	Other	4,600	...	...	...	9,175	...
STANVAC (SOUTH SUMATRA)	Ibul, 1970	5,700	12	14	760	21,667,050	36.0
	Rambutan, 1972	4,500	5	7	29	3,210,751	42.0
	• Tabuan (PSC)	4,000	10	10	1,220	1,178,193	34.0
	Jene, 1985	6,500	8	10	9,564	4,085,391	35.0
	Pian, 1986	6,000	1	1	217	26,512	36.0
	• Kerang (PSC), 1984	2,900	2	3	744	271,616	35.0
	Lagan, 1986	2,400	4	4	290	111,815	56.8
	Other	4,500	3	3	196	868,406	...
ROY M. HUFFINGTON INC.	Badak, 1972	5,190-10,600	36	107	5,362	37,953,108	32.0
	Nilam, 1974	7,500-11,500	36	95	5,640	18,470,239	32.0
	Pamaguan, 1974	900- 5,100	14	27	1,962	5,898,117	30.0
	Mutiara, 1984	900- 5,800	12	19	2,599	2,961,789	30.0
	Semberah, 1974	2,900-10,100	...	16	...	7,054	35.0
TOTAL CFP	• Tambora, 1980	8,000-13,000	15	34	4,109	5,667,498	33.0
	• Handil, 1974	2,900- 9,000	219	272	115,033	617,340,703	33.0
	• Bekapai, 1972	4,600- 5,600	42	45	15,845	152,065,282	40.0
UNOCAL	• Attaka, 1970	7,500	75	88	47,115	433,197,460	39.0
	• Melahin, 1972	7,500	3	6	888	6,217,272	23.1
	• Kerindingan, 1972	7,000	...	8	20	5,038,615	23.8
	• Sepinggan, 1973	11,150	16	18	5,855	41,580,242	34.0
	• Yakin, 1976	5,100	21	28	8,917	18,290,674	18.8
	• Rajah, 1981	5,500	3	3	1,672	3,596,380	33.8
CONOCO GROUP	• Udang, 1974	5,595	22	28	8,646	53,319,790	40.0
	• Kepiting, 1982	6,000	2	2	2,570	1,094,050	37.0
MOBIL OIL	Arun, 1971	10,050	40	57	110,819	293,625,359	55.0
TESORO INDONESIA PETROLEUM	Samboja, 1909	360- 4,380	28	126	487	64,387,468	21.0
	Sanga Sanga, 1897	275- 6,000	107	240	2,941	266,631,554	32.0
	Tarakan, 1906	200- 6,540	130	1,165	1,730	210,151,159	20.0
MARATHON	• Kakap KH, 1980	7,000	11	12	16,150	9,343,000	45.0
HUDBAY (MALACCA STRAIT)	• Lalang, 1980	3,100- 3,600	13	16	10,870	30,550,000	39.6
	• Mengkapan, 1981	3,850- 4,450	10	10	22,300	8,440,000	42.0
	• Melibur, 1984	900- 1,300	12	13	8,680	3,210,000	35.6
	• Kurau, 1986	4,500- 5,000	7	7	...	...	47.4
TARAKAN PETROLEUM	Tarakan (Mamburungan field), 1984	5,227- 5,291	2	4	...	...	31.1
	Total Indonesia		6,065	10,677	1,186,000	12,330,062,000	
IRAN[e]	NIOC						
	Agha Jari, 1936	7,440	58	89			34.0
	Ahwaz Asmari, 1958	8,150	73	85			32.0
	Ahwaz Bangestan, 1958	12,000	...	7			24.3
	Bibi Hakimeh, 1961	4,570	19	33			29.9
	Binak, 1959	10,440	...	4			29.9
	Chillingar, 1974	3,350	...	1			39.3
	Chesmeh Khush, 1967	10,700	...	4			27.7
	Dehluran, 1972	11,900	...	6			31.0
	Gachsaran, 1937	3,400	46	62			31.0
	Haft Kel, 1927	1,980	2	11			37.7
	Karanj, 1963	5,360	7	7			33.9
	Kharg, 1961	10,900	...	...			31.6
	Kupal, 1965	10,500	...	7			32.8
	Lab-e Safid, 1968	4,350	...	7			35.3
	Mansuri, 1963	7,100	4	8			28.4
	Marun, 1963	9,400	55	112			26.6
	Masjid-e Suleiman, 1908	1,600	7	24			39.3
	Naft Safid, 1938	5,000	5	19	2,309,000	35,852,300,000	36.8
	Paris, 1964	4,670	22	27			38.8
	Par-e Siah, 1964	4,250	...	1			37.7
	Pazanan, 1961	7,250	44	71			37.2
	Rag-e Safid, 1964	7,230	19	29			28.6
	Ramin, 1966	12,200	...	...			32.9
	Ramshir, 1962	8,750	...	3			27.6
	Sulabedar, 1971	3,400	...	1			30.4
	Naft-e Shah, 1923	2,000- 3,000	...	...			43.0
	• Bahregansar, 1960	9,000	...	...			30.0
	• Hendijan, 1968	11,000	...	...			23.0
	• Nowruz, 1966	8,200	...	...			21.0
	• Rakhsh, 1969	7,650	...	...			35.8
	• Rostam, 1966	7,000	...	...			34.4
	• Ardeshir, 1969	2,800	...	...			27.0

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
		• Cyrus, 1962	7,000	...	...			18.3
		• Darius, 1961	11,000	...	...			34.0
		• Fereidoon, 1966	7,000	...	...			28.5
		• Sassan, 1965	7,500- 8,100	...	...			34.0
		Total Iran		**361**	**618**	**2,309,000**	**35,852,300,000**	
IRAQ		Ain Zalah, 1939	5,200- 6,500	10	28			31.0
		Bai Hassan, 1953	4,800- 5,400	62	77			34.0
		Buttmah, 1953	3,900	6	17			31.0
		Hamrin, 1973	2,000	...	14			...
		Jambur, 1954	5,500-12,500	32	50			38.0
		Kirkuk, 1927	2,800- 4,200	65	238			36.0
		Naft Khaneh, 1909	3,500	6	11			42.5
		Rumaila North, 1958	7,300-10,300	291	433	2,360,000	19,630,000,000	33.0
		Rumaila South, 1953	7,300-10,200	126	201			34.0
		Zubair, 1949	7,400-10,200	53	108			35.0
		Abu Ghurab, 1971	9,800	15	16			24.0
		Buzurgan, 1970	12,000	19	22			24.0
		Jabal Fauqui, 1974	10,000	20	23			25.5
		Luhais, 1961	200	16	20			33.0
		Qaiyanah, 1929	650	42	50			16.0
		East Baghad, 1975	6,000- 7,000	72	79			17.0-23.0
		Suffayah, 1978	3,900	28	39			25.0
		Nahr Umar, 1949	8,200	5	13			42.0
		Total Iraq		**868**	**1,439**	**2,360,000**	**19,630,000,000**	
ISRAEL	**LAPIDOTH**	Heletz-Brur, 1955	5,200	3	18	71	12,275,749	29.2
		Kochav, 1962	5,500	5	13	179	4,176,980	27.9
	OEIL	Ashdod, 1976	8,400	2	2	37	142,300	32.5
	EMOG	Gurim, 1984	3,280	...	...	...	6,950	17.0
		Total Israel		**10**	**34**	**287**	**16,601,979**	
ITALY	**AGIP**	Cavone, 1979	10,663-18,068	13	15	2,248	6,595,652	24.0
		Malossa S. Bartolomeo, 1973	17,881-21,231	3	11	1,272	25,405,322	55.0
		Fisticci-S. Cataldo, 1960	6,820- 6,880	7	11	1,376	7,444,887	11.4
		Gela, 1956	11,280-11,350	45	68	8,704	99,768,192	10.0
		Perla, 1982	7,850	4	4	732	1,558,244	13.3
		Cela Mare, 1959	10,300	6	17	1,386	14,019,078	10.0
		Ragusa, 1954	5,760	41	41	4,790	126,201,977	19.5
		Nilde, 1977	4,545	2	3	11,802	18,935,805	38.9
		S. Maria, 1980	7,590	3	3	181	258,168	15.9
		Emilio S., 1985	9,215	1	1	...	337,622	13.0
		Narciso, 1985	2,650	1	1	...	989,278	21.1
		Other	...	25	63	4,001	19,949,277	2.8-55.9
	ELF	• Santa Maria a Mare, 1974	7,900	9	10	1,695	17,240,000	23.0
		• Rospo Mare, 1975	4,600	9	9	17,880	10,644,00	11.0
		• Sarago Mare, 1979	5,200	5	5	4,830	7,917,000	8.0
		Total Italy		**174**	**262**	**60,897**	**357,264,502**	
IVORY COAST	**ESSO COTE D'IVOIRE**	• Belier, 1975	6,500	11	18	4,184	16,750,000	35.0
	PHILLIPS-AGIP-SEDCO-PETRIOCI	• Espoir, 1980	6,500-11,000	6	8	11,990	28,085,648	32.3
		Total Ivory Coast		**17**	**26**	**16,174**	**45,835,648**	
JAPAN[e]	**JAPEX**	• Aga-Oki, 1972	7,590	7	7			24.8
		Higashi-Niigata, 1965	4,500- 9,200	18	28			53.9
		Sarukawa, 1958	2,000- 3,200	62	134			32.3
		Yoshii, 1968	8,000	9	25			61.8
		Yurihara, 1976	1,310- 7,610	9	14			43.5
		Katakai, 1960	3,310-16,300	5	16			50.0
		Other	...	56	77			...
	IDEMITSU OIL DEVELOPMENT CO. LTD.	• Agaoki-Kita, 1982	4,950	10	10	12,200	139,623,000	33.0
	TEIKOKU OIL	Yabase, 1933	1,100- 5,800	61	73			33.0
		Minami-Aga, 1964	7,300- 9,600	10	26			38.5
		Minami-Nagaoka, 1984	13,200-15,100	5	11			55.7
		Hagashi-Kashiwazaki, 1970	6,000- 8,900	6	13			62.0
		Kubiki, 1959	1,100- 6,400	94	125			29.7
		Other	...	35	47			...
		Total Japan		**387**	**606**	**12,200**	**139,623,000**	
JORDAN	**NRA**	Hamzah, 1984	9,515	3	3	500	295,437	30.0
		Total Jordan		**3**	**3**	**500**	**295,437**	

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
KUWAIT[e]	KOC	Burgan, 1938	4,800	210	393			30.8
		Ahmadi, 1952	4,800	11	84			31.7
		Magwa, 1951	4,800	71	113			33.0
		Raudhatain, 1955	8,600	41	53			34.4
		Bahra, 1956	8,500	...	2	1,122,000	22,649,998,000	...
		Sabriya, 1957	8,300	9	44			36.3
		Minagish, 1959	10,000	1	21			34.4
		Umm Gudair, 1962	9,000	20	33			26.9
		Total Kuwait		**363**	**743**	**1,122,000**	**22,649,998,000**	
LIBYA	AGIP	Bu Attifel, 1968	14,300	28	37	136,758	770,690,617	40.8
		Rimal Katib, 1965	14,000	3	7	6,412	5,252,690	35.0
	ELF	El Meheiriga	10,500	1	2	829	22,599,371	46.0
	LNOC[e]	Arshad, 1966	10,100					42.0
		Jebel, 1962	8,100					38.0
		Majid, 1[illegible]	9,000- 9,800					...
		Don Mansour Unit	5,600					...
		Nasser, 1959	5,500- 7,600					38.0
		Lehib-Dor Marada Unit, 1965	9,500					50.0
		Raguba, 1961	5,400					43.0
		Beda, 1959	4,000					36.0
		Bualawn, 1972	6,000					40.0
		Dor, 1967	6,400					33.2
		Kotla, 1963	5,500					34.0
		Sahabi B & D, 1961	9,000-10,000					39.0
		Sarir, 1961	9,000					37.2
		Amal, 1959	9,900					37.5
		Ora, 1962	7,250					40.2
		Ghani, 1978	6,000					40.0
		Bahi, 1968	3,500- 3,750					43.4
		Belhedan, 1962	7,000					33.6
		Dahra, 1959	3,100- 3,700					37.0-41.0
		Defa, 1969	5,400- 5,900					35.6
		Gialo, 1961	2,200- 6,300					35.7
		Harsh, 1978	7,400	491	491	946,001	15,329,782,322	34.6
		Khalifa, 1978	5,400- 7,000					34.6
		Masrab, 1978	10,000					39.6
		Samah, 1961	9,000					33.4
		Waha, 1960	6,000					36.0
		Zaggut, 1962	6,000					36.4
		Bajat, 1983	5,100- 5,400					32.2
		Ali, 1975	3,900	1	2			50.0
		Almas, 1975	4,000	5	8			49.5
		Intisar A, 1967	9,750	8	19			45.0
		Intisar B, 1974	9,600	2	2			50.0
		Intisar C, 1967	9,650	1	6			37.5
		Intisar D, 1967	9,400	19	27			39.0
		Intisar E, 1968	5,300- 7,100	8	11			34.7
		Nafoora-Augila, 1966	2,200-10,000	13	55			35.5
		Aswad, 1978	6,250	8	8			46.0
		Sabah, 1977	5,500	36	38			42.0
		Zella, 1977	6,750	27	31			48.1
		Other	7,900- 8,900	1	2			40.4
		Fidaa, 1979	7,000	9	9			41.7
		Hakim, 1978	6,700	3	3			48.5
		Total Libya		**664**	**758**	**1,090,000**	**16,128,325,000**	
MALAYSIA	ESSO MALAYSIA	• Bekok, 1976	5,500	23	30			47.0
		• Pulai, 1973	4,300	23	32			42.3
		• Tapis, 1975	6,700	70	106			45.0
		• Kepong, 1979	6,000	3	10			47.0
		• Tiong, 1978	5,800	28	42			47.0
		• Tinggi, 1980	4,400	26	31	268,000	759,820,000	48.0
		• Irong Barat, 1979	3,300	10	12			35.0
		• Semangkok, 1980	3,700	5	5			42.5
		• Guntong, 1978	...	9	14			...
		• Palas, 1979	...	11	11			...
		• Tabu, 1978	...	9	13			...
	PETRONAS CARIGALI[e]	• Tembungo, 1971	6,000	8	16	10,620	31,276,000	40.0
		• Fairley Baram, 1973	8,655	...	2	...	5,845,000	39.5
	SARAWAK SHELL	• D18, 1981	4,000	5	5	4,160	1,618,000	35.0
		• West Lutong, 1966	5,600	12	27	10,110	121,690,000	39.5
		• Baram, 1963	9,500	12	36	7,640	135,989,000	40.5
		• Bakau, 1971	11,000	3	3	130	7,047,000	39.0
		• Temana, 1972	3,100	18	31	9,070	36,211,000	35.0
		• Bayan, 1976	4,200	6	7	13,750	21,719,000	35.0
	SARAWAK SHELL/PETRONAS CAG.	• Baronia, 1967	7,900	19	40	15,260	148,770,000	42.0
		• Betty, 1967	7,900	13	17	14,320	62,327,000	38.0

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	• Tukau, 1966	5,000	26	48	22,600	91,749,000	29.2
	• Bokor, 1972	2,000	18	19	24,140	34,011,000	35.0
	• Siwa, 1973	4,100	4	4	1,360	1,496,000	25.0
SABAH SHELL	• Barton, 1971	2,400	4	4	3,920	9,331,000	37.0
	• South Furious, 1974	3,300	7	15	3,010	13,499,000	30.0
	• St. Joseph, 1975	2,200	11	14	16,360	20,271,000	32.0
	• Erb West, 1977	6,785	15	19	6,630	21,620,000	30.0
	• Samarang, 1972	5,700	49	70	53,370	235,380,000	37.0
	• Ketam, 1977	4,800	1	6	550	901,000	33.0
	Total Malaysia		**448**	**689**	**485,000**	**1,760,571,000**	
MEXICO[e] NORTH ZONE, NE	Misión, 1945	5,440	3	3			
	Monterrey, 1950	6,510	5	6			
	Tigrillo, 1971	3,342	...	11			
NORTH ZONE, N.	• Arenque, 1970	11,362	17	17			26.0
	Constituciones, 1956	6,350	176	176			17.0
	Ebano-Panuco, 1901	1,450	324	324			12.0
	Tamaulipas	4,200	152	152			19.0
NORTH ZONE, S.	Chicontepec, 1973	4,264	220	220			34.1
	• Isla de Lobos, 1963	6,875	9	9			40.0
	• Marsopa, 1974	10,198	7	7			39.0
	Naranjos-C. Azul, 1909	1,800	206	206			22.0
	Tres Hermanos, 1959	6,960	34	34			21.0
	Other	...	...	...			...
CENTRAL ZONE, POZA RICA	• Atún, 1966	9,040	7	7			37.0
	• Bagre, 1973	10,919	8	8			33.0
	Escolin, 1942	7,216	95	95			26.3
	Hallazgo, 1955	10,170	36	36			25.0
	Jiliapa, 1958	7,390	29	29			24.0
	Mecatepec, 1941	7,544	32	32			29.8
	Miquetla, 1959	6,480	57	57			35.0
	Poza Rica, 1930	7,090	132	132			35.0
	Pres. Aleman, 1949	8,036	86	86			26.0
	Remolino, 1962	10,745	36	36			29.5
	San Andrés, 1956	10,410	123	123			29.0
	Other	...	315	316			...
CENTRAL ZONE, CUENCA DEL PAPALOAPAN	Matapionche, 1974	11,129	29	45			35.6
	Other	...	22	31			...
SOUTHERN ZONE, NANCHITAL	Ixhuatlán Ote., 1965	1,960	20	34			22.6
	Moloacán, 1962	500	170	207			22.3
	Santa Rosa, 1952	1,312	6	9			25.4
CENTRAL ZONE, N. FAJA DE ORO	Acuatempa, 1955	4,085	6	6			21.0
	Muro, 1965	3,966	11	19			17.0
	Ordónez, 1952	5,220	8	8			21.0
	Ocotepec, 1953	3,737	13	13			20.0
	Santa Agueda, 1953	4,780	3	3			16.0
	Other	...	57	57			...
SOUTHERN ZONE, EL PLAN	Agata, 1956	3,830	9	15			
	Bacal, 1976	3,500	24	40			35.0
	Concepción, 1974	1,600	3	15			31.0
	Cuichapa, 1935	2,200	63	123			30.0
	El Plan, 1931	1,700	67	86			30.0
	Lacamango, 1973	1,700	18	27			26.3
	Los Soldados, 1953	4,492	18	22			32.0
	Other	...	26	38			...
SOUTHERN ZONE, AGUA DULCE	Blasillo, 1967	7,216	31	58	2,541,000	14,676,444,000	40.0
	Cinco Presidentes, 1960	6,862	73	134			35.0
	Burro, 1931	2,200	23	38			26.0
	Venta, 1954	4,730	20	83			41.0
	Ogarrio, 1957	5,790	57	194			38.0
	Otates, 1965	7,459	12	18			39.0
	Rodador, 1971	11,398	14	14			26.0
	Sánchez Magallanes, 1957	4,240	73	345			27.0
	San Ramón, 1967	9,517	29	65			30.0
	Tonalá, 1928	1,770	31	61			28.0
	Other	...	3	15			...
SOUTHERN ZONE, COMALCALCO	Agave, 1977	13,450	7	16			41.7
	Arroyo Zanapa, 1978	14,599	1	2			38.9
	Arteza, 1977	11,800	3	5			26.4
	Ayapa, 1972	8,200	3	5			7.2
	Cacho López, 1977	14,250	1	1			29.0
	Cactus, 1972	14,100	14	30			31.5
	Carrizo, 1962	3,500	18	35			23.3
	Castarrical, 1967	10,080	38	59			29.3
	Comoapa, 1979	14,432	4	6			44.5
	Copano, 1977	11,890	9	10			43.9
	Cunduacán, 1974	13,775	12	42			28.9

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells — Producing	No. of wells — Total	Production — 1987 average B/d	Production — Cumulative to Dec. 31, 1987 Bbl	°API gravity
		El Golpe, 1963	3,500	93	135			25.7
		Giraldas, 1977	15,225	21	22			37.0
		Iride, 1974	13,775	12	16			28.5
		Muspac, 1982	9,676	1	13			57.0
		Mecoacan, 1957	2,200	17	30			8.6
		Mora, 1981	...	61	63			38.1
		Mundo Nuevo, 1977	11,800	4	5			46.0
		Nispero, 1974	14,100	4	18			34.4
		Paredon, 1978	15,690	12	13			39.8
		Oxiacaque	11,150	5	21			29.1
		Platanal, 1978	15,900	...	...			30.2
		Rio Nuevo, 1975	14,950	5	5			34.8
		Samaria (Cret), 1973	14,209	26	49			31.0
		Santuario, 1966	9,617	28	37			37.0
		Sitio Grande, 1972	13,766	19	22			35.0
		Sunuapa, 1978	12,887	2	7			32.8
		Tapijualpa, 1982	15,613	1	12			39.8
		Tintal, 1968	5,904	4	6			22.0
		Topen, 1978	11,172	2	3			25.4
		Tupilco, 1959	9,685	67	101			27.0
		Bellota, 1982	17,056	9	12			41.0
		Cardenas, 1979	17,548	26	45			38.0
		Chiapas, 1979	12,136	5	7			42.0
		Fenix, 1979	17,876	4	7			40.0
		Iris, 1979	14,432	8	8			39.2
		Jujo, 1980	17,548	18	19			32.0
		Caparroso, 1982	18,368	1	1			41.2
		Tecominoacan, 1983	19,519	1	5			37.5
		Jolote, 1983	18,119	1	1			39.4
		Artesa Terc., 1984	...	2	3			28.0
		Carmito, 1980	10,050	1	1			45.6
		Edén, 1983	17,590	1	2			38.5
		Samaria Terc., 1965	4,920	16	23			13.9
		Other	...	16	37			...
	GULF OF CAMPECHE	• Cantarell, 1976	8,528	63	75			21.3
		• Abkatun, 1978	11,800	25	35			30.0
		• Ku, 1979	10,000	8	15			22.0
		• Pol, 1979	12,600	8	8			35.0
		• Chuc, 1982	13,100	1	3			35.0
		• Ixtoc, 1984	...	1	2			35.0
		Total Mexico		3,768	5,120	2,541,000	14,676,444,000	
MOROCCO		Essaouira	...	4	4	370	16,157,000	...
		Rharb, 1951	4,590	1	1	28		...
		Total Morocco		5	5	398	16,157,000	
NETHERLANDS	UNOCAL	• Helm, 1979	4,400	7	8	2,390	6,999,012	17.9
		• Helder, 1980	4,800	12	13	8,536	16,807,755	21.6
		• Hoorn, 1981	5,000	7	7	6,258	17,385,582	25.8
	NAM	DeLier, 1955	5,200	22	33	480	16,775,000	34.8
		Rotterdam, 1984	NA	2	2	680	848,000	32.0
		Berkel, 1954	NA	17	17	2,330	4,750,000	20.0
		Ysselm, 1956	5,200	59	86	4,500	88,943,000	22.0
		Pijnacker, 1955	NA	4	5	500	5,983,000	22.0
		Wassenaar, 1956	4,200	28	41	1,740	46,535,000	18.7
		Zoetermeer, 1957	3,200	30	33	510	9,786,000	16.5
		Werkendam, 1958	NA	...	...	20	207,000	33.0
		Schoonebeek, 1944	2,500	362	481	9,580	232,097,000	35.6
	CONOCO	Kotter, 1980	6,500	9	11	19,667	24,911,460	33.0
		Logger, 1982	6,500	7	8	12,390	8,746,740	33.5
	AMOCO	• Rijn, 1982	6,600	12	25	12,900	10,980,550	35.0
		Total Netherlands		478	767	82,481	492,205,099	
NEUTRAL ZONE[e]	AOC	• Khafji, 1961	4,400-10,300	111	130			28.2
		• Hout, 1969	5,300-10,500	47	67			33.0
	CHEVRON & KOC	Wafra, 1953	1,100- 7,000	312	392	389,000	4,304,878,000	18.9-23.5
		S. Fuwaris, 1963	6,300	6	9			25.0
		S. Umm Gudair, 1966	8,900	16	18			24.3
		Total Neutral Zone		492	616	389,000	4,304,878,000	
NEW ZEALAND	SHELL-BP-TODD	• Kapuni, 1959	11,700	8	9			54.0
		• Maui, 1969	11,000	12	14			58.0
	PCNZ	McKee, 1980	7,848- 8,251	17	19			38.5
		Kaimiro, 1982	11,900	1	1	29,000	78,539,000	46.4
		Tariki, 1986	...	1	1	...	...	...
		Ahuroa, 1987	...	1	1	...	...	...
		Total New Zealand		40	45	29,000	78,539,000	

WORLDWIDE PRODUCTION

NIGERIA

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
AGIP	Akri, 1967	9,600-10,600	2	12	848	59,375,372	43.8
	Akri West, 1972	9,900-10,200	...	2		482,258	31.4
	Ashaka, 1968	9,700-12,000	1	1	588	2,443,257	42.2
	Beniku, 1974	12,000	...	2		3,309,326	29.5
	Ebegoro, 1976	11,500-12,000	6	9	8,303	59,359,488	40.5
	Ebocha, 1965	8,000-10,900	4	16	5,508	107,790,957	40.4
	Idu, 1973	7,750-10,700	...	10		23,862,951	28.0
	Kwale, 1967	10,000-11,500	6	10	4,381	4,694,547	42.4
	M'Bede, 1966	7,300- 9,400	8	20	15,735	157,971,247	44.9
	Obama, 1973	11,600-14,300	6	8	16,240	92,445,019	42.7
	Obiafu, 1967	9,300-12,200	14	20	11,075	79,977,676	45.0
	Obrikom, 1976	8,000-10,000	6	11	5,527	53,807,211	46.7
	Odugri, 1972	12,500	2	3	333	9,556,180	42.9
	Ogbogene, 1972	10,000	...	2		3,302,763	37.0
	Ogboge S.W., 1982	13,000	...	1		353,136	56.2
	Okpai, 1968	10,000-12,000	8	9	3,129	17,281,882	47.3
	Omoku W., 1975	11,500	1	1	83	4,746,492	38.3
	Oshi, 1972	9,600-11,300	9	10	8,733	62,932,362	40.6
	Tebidaba, 1975	10,300-13,300	7	10	17,661	112,234,712	40.1
	Umuoru, 1975	14,100	2	4	2,049	4,446,722	43.4
	Agwe, 1975	10,800	...	2	12	2,002,300	49.4
	Clough Creek, 1977	10,000-12,400	9	9	7,801	19,738,108	44.4
	• Beniboye N., 1978	9,000-10,000	9	9	8,437	8,313,466	35.5
ASHLAND	Izombe-Ossu, 1974	9,500	17	17	12,641	4,613,854	41.0
	• Akam, 1980	6,700	8	8	8,315	3,035,036	35.2
	• Adanga, 1980	10,611-17,586	8	8	13,262	10,645,430	35.0
ELF	Aghigo, 1972	...	18	19	3,992	22,770,998	24.8
	Okpoko, 1967	...	20	22	7,617	29,653,693	24.8
	Obodo-Jatumi, 1966	...	21	25	17,910	63,216,952	24.8
	Upamini, 1965	...	13	14	3,842	15,580,567	24.8
	Obagi, 1964	...	81	92	43,140	350,235,015	24.6
	Erema, 1972	...	4	5	3,448	9,122,120	24.6
GULF NIGERIA[e]	Abiteye, 1970	5,750- 9,400	12	19			39.7
	• Delta, 1965	5,600- 9,500	22	27			37.3
	• Delta South, 1965	7,100-10,179	18	27			38.4
	• Isan, 1970	5,900- 9,000	4	11			40.4
	Makaraba	7,100-12,005	12	26			27.7
	• Malu, 1969	4,800- 6,300	12	18			40.4
	• Mefa, 1965	8,570-12,030	4	5			38.1
	• Meji, 1965	5,200-10,900	19	22			31.9
	• Meren, 1965	5,000- 7,500	28	51			31.9
	• Okan, 1964	5,500- 9,245	36	67			38.1
	• Parabe-Eko, 1968	4,500- 8,200	11	23			40.4
	Utonana, 1971	7,400- 9,165	2	5			20.4
	• W. Isan, 1971	7,825-10,229	4	9			40.4
	Yoria South, 1974	11,389-12,635	...	2			41.0
	Jisike, 1975	6,300- 7,600	3	4			41.1
	Robertkiri, 1964	11,484-13,190	5	12			40.2
	• Tapa, 1978	8,150-10,842	10	10			39.5
MOBIL[e]	• Adua, 1967	6,970	4	5			30.3
	• Asabo, 1966	5,600	8	14			32.4
	• Ekpe, 1966	8,200	5	17			30.3
	• Ekpe-WW, 1977	6,810	6	6			30.3
	• Eku, 1966	5,420	1	6			30.8
	• Eniang, 1968	6,600	18	23			35.1
	• Etim, 1968	6,200	7	9			32.9
	• Idoho, 1966	9,020	3	4			30.8
	• Inim, 1966	5,850	8	10			37.8
	• Mtem, 1967	5,200	3	3			36.1
	• Ubit, 1968	5,400	30	45			36.1
	• Unam, 1968	5,180	6	9			33.5
	• Utue, 1966	5,700	4	7			36.8
	• Isobo, 1968	7,345	3	4			30.8
	• Iyak	...	6	6			38.7
	• Asabo 'D'	...	1	2			35.0
	• Ata	...	...	...			...
	• Oso	...	...	...			...
	• Usari	...	...	...			...
PAN OCEAN (NIGERIA)[e]	Ogharefe, 1973	9,900	8	11			47.4
SHELL[e]	Ugh-Ogini, 1964	5,860	7	17			19.0
	Ugh-Uzere-East, 1960	8,500	11	13			23.0
	Ugh-Uzere-West, 1964	8,500	10	11			23.0
	Ugh-Olomoro, 1963	7,000-10,000	28	32			22.0
	Ugh-Oweh, 1964	12,300	11	11			28.0
	Ugh-Kokori, 1960	8,000- 9,800	22	27			42.0
	Ugh-Afiesere, 1966	8,000- 9,000	31	33			22.0
	Ugh-Eriemu, 1961	12,500	15	16			26.0
	Ugh-Ughelli-East, 1959	11,800	9	11			35.0
	Ugh-Ughelli-West, 1963	7,400-10,200	8	10			21.0
	Ugh-Utorogu, 1964	9,000	13	19			25.0

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Ugh-Oroni, 1964	12,000	7	7			22.0
	Ugh-Warri-River, 1961	12,264	2	3			31.0
	Ugh-Ewreni, 1968	10,900	7	11			38.0
	Ugh-Isoko, 1960	...	1	2			19.0
	Forc-Odidi, 1967	10,980	24	29			37.0
	Forc-Opukushi, 1963	7,823	10	14			29.0
	Forc-Jones Creek, 1967	7,000- 9,000	31	34			29.0
	Forc-Opuama, 1973	...	3	5			41.0
	Forc-Egwa, 1967	9,350	13	22			37.0
	Forc-Forcados Yokri, 1968	10,859	63	83			22.0
	Forc-Batan, 1968	11,000	8	9			27.0
	Forc-Escravos Beach, 1969	8,176	9	13	953,413	10,172,279,000	36.0
	Forc-Otumara, 1969	8,176	25	28			25.0
	Forc-Saghara, 1970	8,590	3	6			31.0
	Forc-Ajuju, 1970	13,324	1	2			27.0
	Forc-Benisede, 1973	...	15	19			23.0
	Node-Sapele, 1970	12,788	13	19			42.0
	Node-Oben, 1972	12,036	18	23			40.0
	Forc-Opukushi N., 1977	...	1	2			30.0
	Abura	...	1	3			44.8
	Rapele	...	1	2			44.4
	Amukpe	...	2	2			38.9
	Osioka	...	2	2			...
	Phl-Bomu, 1958	6,500- 7,500	14	39			36.0
	Phl-Imo River, 1959	5,800-10,000	32	47			32.0
	Phl-Nkali, 1963	12,000	4	10			42.0
	Phl-Elelenwa, 1959	11,000	6	11			39.0
	Phl-Umuechem, 1969	5,800-10,700	8	19			36.0
	Phl-Apara, 1960	9,000	4	8			36.0
	Phl-Bodo-West, 1959	9,700	9	11			29.0
	Phl-Afam, 1956	6,000	8	15			45.0
	Phl-Yoria, 1970	11,917	9	13			44.0
	Phs-Bonny, 1959	12,254	9	15			36.0
	Phs-Cawthorne Channel, 1963	11,000	21	30			38.0
	Phs-Ekulama, 1958	10,483	22	29			32.0
	Phs-Soku, 1958	11,500	15	23			31.0
	Phs-Oruhiri, 1971	...	2	6			38.0
	Egb-Oguta, 1965	10,300	9	21			46.0
	Eade-Utapate South, 1974	...	6	11			44.0
	Eade-Opobo South, 1974	...	4	6			44.0
	Ibigwe	...	2	2			...
	Korokoro	...	6	8			34.3
	Otamini	...	3	5			21.8
	Ugada	...	1	1			...
	Ahia	...	8	12			38.2
	Akpor	...	2	3			27.5
	Alakiri	...	12	21			38.2
	Assa	...	2	2			20.7
	Egbema West	...	7	16			42.2
	Ebubu	...	2	8			22.2
	Egbema	...	6	7			35.5
	Cesw-Nun River, 1960	...	4	6			39.0
	Cesw-Etelebou, 1971	12,000	9	9			33.0
	Cesw-Kolo Creek, 1960	12,000	15	25			42.0
	Cesw-Diebu Creek, 1966	...	10	12			43.0
	Phl-Isimiri, 1964	5,900-11,000	4	6			28.8
	Phl-Onné, 1965	10,384	3	3			29.0
	Phl-Obigbo-North, 1963	6,500-10,000	26	37			22.0
	Phl-Ajokpori, 1967	...	2	2			29.0
	Phl-Agbada, 1960	8,000-12,000	37	48			32.1
	Phl-Akuba, 1967	...	1	1			29.0
	Cesw-Adibawa, 1967	11,950	11	23			26.0
	Cesw-Adibawa NE, 1973	...	3	3			26.0
	Cesw-Ubie, 1961	14,380	4	5			28.0
	Phl-Obeakpu, 1975	...	2	4			45.0
	Cosw-Nembe Creek, 1973	...	38	38			35.0
	Phs-Akaso, 1979	...	1	1			30.0
	Bugama Creek	...	3	6			43.0
	Kalaekule	...	7	7			39.6
	Krakama	...	6	10			23.8
	Odeama Creek	...	5	5			33.3
	Tai	...	2	2			37.4
	Obele	...	5	5			...
	Rumuekpe	...	2	3			...
	Enwhe	...	2	2			...
	Akaso	...	1	1			...
TEXACO-CHEVRON •	Pennington, 1965	5,000-10,400	2	9	1,980	24,377,203	38.2
•	Middleton, 1972	5,000- 7,000	3	7	2,710	14,948,284	36.6
•	North Apoi, 1973	4,000- 8,100	23	26	31,150	150,632,247	35.8
•	Funiwa, 1978	5,000- 7,000	20	22	22,130	35,788,219	38.2
•	Sengana, 1967	...	1	2	7	666,120	46.7
	Total Nigeria		1,522	2,179	1,242,000	11,797,891,200	

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
NORWAY	PHILLIPS	• Ekofisk, 1968	10,000	35	38	82,076	910,326,654	41.1
		• West Ekofisk, 1970	10,300	12	12	3,620	81,829,312	43.9
		• Cod, 1968	9,500	6	6	923	19,353,892	55.0
		• Tor, 1970	10,000	8	13	9,624	114,531,350	38.0
		• Albuskjell, 1972	10,400	15	15	2,362	49,738,965	45.0
		• Edda, 1972	10,480-10,600	7	7	803	22,859,793	41.5
		• Ekofisk, 1970	9,350-10,000	32	32	58,106	223,241,326	37.6
	MOBIL	• Statfjord, 1974	7,700	55	86	*602,657	*1,022,483,814	39.0
	AMOCO	• Valhall, 1972	8,200	20	20	59,841	79,826,000	35.0
	CONOCO	• Murchison, 1975	9,900	20	28	14,863	55,950,200	38.0
		• Ula, 1976	11,000	5	5	78,978	34,136,970	39.0
*Norwegian production share.		**Total Norway**		**215**	**262**	**913,853**	**2,614,278,276**	
OMAN	PDO	Lekhwair, 1968	4,352	40	57	17,598	57,132,000	37.8
		Natih, 1963	4,788	35	65	23,021	341,981,000	31.0
		Shibkah, 1976	2,591	2	2	296	761,366	31.0
		Fahud, 1964	2,499	138	215	66,586	751,259,000	32.7
		Yibal, 1962	8,465	164	170	145,028	613,558,000	40.2
		Al Huwaisah, 1969	5,320	37	39	16,460	165,710,000	37.0
		Burhaan, 1984	4,011	3	3	610	1,327,000	36.7
		Ghaba North, 1972	2,227	18	24	11,177	49,722,000	35.8
		Saih Nihaydah, 1972	8,700	19	26	29,620	146,651,000	39.0
		Saih Rawl, 1973	9,826	15	24	9,592	87,444,000	41.1
		Qarn Alam, 1972	1,354	4	7	1,050	18,983,000	14.8
		Habur, 1975	5,800	1	2	107	4,315,000	14.8
		Mahjour, 1979	11,700	1	4	579	2,057,000	37.2
		Al Ghubar, 1974	1,916	6	7	2,220	3,699,000	23.5
		Barik, 1974	8,856	3	4	2,000	1,447,000	42.1
		Anzauz, 1984	7,098	3	3	5,321	5,026,000	47.8
		Hasirah, 1984	8,708	5	6	4,850	2,024,000	48.8
		Zauliyah, 1981	8,177	10	15	6,944	10,819,000	45.2
		Wafra, 1983	5,510	2	6	2,025	1,352,000	40.6
		Suwaihat, 1982	6,452	8	11	8,473	7,976,000	36.0
		Bahja, 1984	5,697	4	7	5,120	4,428,000	44.5
		Fayyadh, 1983	3,608	1	1	491	308,000	27.0
		Sayyala, 1981	3,690	11	11	27,645	21,046,000	39.7
		Zareef, 1985	3,264	6	7	6,699	2,963,000	46.9
		Rima, 1979	3,247	34	34	61,623	105,722,000	32.8
		Rasha, 1982	4,310	4	5	1,120	1,025,000	32.8
		Nimr, 1980	3,296	78	78	24,393	10,881,000	21.3
		Karim West, 1982	3,546	15	15	12,215	10,108,000	23.5
		Amal/Amal South, 1973	4,638	29	31	9,888	7,485,000	22.5
		Birba, 1978	8,528	...	2	...	7,280,000	34.0
		Kaukab, 1983	8,282	...	1	761	925,000	35.8
		Marmul, 1977	5,087	174	181	42,558	110,364,000	22.0
		Rahab, 1977	3,237	19	25	3,390	5,372,000	22.0
		Qaharir East, 1978	4,936	1	3	109	667,000	30.6
		Qaharir, 1978	4,536	22	28	7,186	21,048,000	30.6
		Qata, 1979	4,707	9	14	2,007	3,623,000	26.2
		Runib, 1978	3,215	10	11	2,441	925,000	20.3
		Jalmud, 1979	4,236	3	3	710	264,000	21.0
		Jalmud North, 1980	4,265	2	2	341	138,000	21.0
		Jawdah, 1984	3,570	3	3	2,487	1,001,000	22.0
		Mawhoob, 1985	6,562	1	1	131	48,000	25.7
		Ishan, 1984	5,578	2	2	309	113,000	27.5
		Jameel, 1984	5,906	2	2	258	94,000	30.2
		Al Burj, 1987	6,890	1	1	6	2,000	25.7
		Mukhaizna, 1975	3,478	...	1	31	13,000	15.0
		Dhiab, 1985	5,414	6	6	730	270,000	26.5
		Thuleilat, 1986	3,773	5	5	586	214,000	24.0
		Warad, 1985	4,922	3	3	879	331,000	21.4
		Simsim, 1985	5,250	6	7	2,671	975,000	31.5
		Zahra, 1986	6,562	1	1	398	145,000	32.1
	ELF GROUP	Sahmah, 1978	12,400	6	6	5,174	22,739,617	45.1
		Ramlat	...	1	1	106	93,569	...
	OCCIDENTAL	Safah, 1983	6,500	31	32	5,762	4,180,000	37.8
		Total Oman		**1,004**	**1,220**	**581,782**	**2,618,034,552**	
PAKISTAN	PAKISTAN OILFIELD LTD.	Balkassar, 1946	9,398	2	4	411	31,530,084	26.0
		Joya Mair, 1944	6,900	2	3	373	5,763,597	15.0
		Dhulian, 1936	8,899	14	41	29	41,314,779	48.0
		Khaur, 1915	9,306	1	3	9	4,167,399	33.0
		Meyal, 1968	12,513	8	10	3,228	29,596,654	41.3
	PAKISTAN PETROLEUM LTD.	Adhi, [est] 1978	9,118- 9,190	...	4	...	1,416,737	56.1
	OGDC	Toot, 1968	14,765	14	15	1,500	9,428,741	38.0
		Fimkassar, 1982	12,337	1	1	17	31,809	39.0
		Tando Alam, 1984	8,203	9	14	3,434	4,586,054	41.4

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Ghotana, 1986	7,874	2	2	243	116,202	42.1
		Chak-Naurang, 1986	9,187	2	4	150	54,808	14.3
		Thora, 1987	7,546	2	3	784	286,311	...
	UNION TEXAS	Khaskeli, 1981	3,600	5	9	1,525	6,791,500	39.0
		Laghari, 1983	2,500	5	7	7,591	9,966,525	42.0
		Dabhi, 1984	5,500	3	4	1,520	1,406,679	39.0
		Mazari, 1985	3,520	4	4	5,309	2,230,581	43.0
		Other	...	...	12	...	...	31.0-46.0
*Field was shut in. Normal maintenance operations continue.	OCCIDENTAL	Dhurnal, 1984	13,100	3	6	15,585	15,719,082	38.0
		Total Pakistan		**77**	**146**	**41,708**	**164,407,542**	
PERU	PETROMAR S.A.	• Peña Negra, 1960	3,000- 8,500	168	284	12,296	104,179,142	38.0
		• Lobitos, 1960	3,500- 7,500	115	249	8,322	50,006,041	38.0
		• Litoral, 1955	1,500- 6,000	92	138	2,642	36,409,940	36.0-40.0
		• Providencia, 1967	3,000- 7,000	36	80	1,757	20,834,644	38.0-40.0
		Other	...	4	11	125	197,346	...
	OCCIDENTAL	• Bartra, 1979	8,000- 8,930	10	16	5,240	17,049,168	11.6
		• Capahuari Sur, 1973	11,800-12,900	17	26	10,337	128,708,116	33.2
		• Dorissa, 1978	9,800-10,600	7	12	8,782	34,591,373	30.8
		• Forestal, 1973	9,000- 9,900	8	10	6,663	32,660,815	18.1
		• Huayuri Sur, 1977	10,000-10,800	9	12	4,397	17,406,645	27.1
		• San Jacinto, 1978	7,200- 9,760	12	22	7,027	26,908,128	13.1-23.5
		• Shiviyacu, 1973	9,100-10,100	15	22	23,012	58,561,369	20.4
		• Jibaro, 1974	10,110-10,155	5	6	3,222	6,338,698	10.7
		• Jibarito, 1981	9,000- 9,650	4	5	6,311	9,651,813	10.5
		Other	...	3	11	1,029	2,210,471	...
	OCCIDENTAL BRIDAS	Talara area	1,343- 6,080	770	1,219	7,226	44,628,171	33.2
	PETROPERU	Talara-Lima area, 1869	2,000- 9,000	2,152	5,975	26,347	945,336,088	34.1
		Corrientes, 1971	10,000-12,600	32	36	22,823	86,601,829	29.8
		Pavayacu, 1972	9,600-11,300	10	14	3,301	15,315,532	30.2
		N. Esperanza, 1980	10,200-10,700	2	3	1,149	4,549,394	44.0
		Yanayacu, 1974	11,400-13,600	7	8	1,295	3,771,578	19.1
		Capirona, 1972	9,800-12,000	5	5	723	3,274,242	25.3
		Valencia, 1975	10,500-11,200	...	2	33	534,339	44.0
		Selva Central	...	46	53	1,460	25,296,888	...
		Total Peru		**3,529**	**8,219**	**165,579**	**1,675,021,770**	
PHILIPPINES	ALCORN PHILIPPINES	• South Nido, 1977	6,576- 6,885	3	5	684	15,200,730	27.1
		• Matinloc, 1978	6,656- 6,750	5	5	2,684	8,853,496	43.8
	ALCORN PALAWAN	• Cadlao, 1977	5,734- 5,881	2	2	2,085	9,203,358	45.6
		South Tara, 1987	4,335- 4,436	1	1	52	19,078	40.4
		Total Philippines		**11**	**13**	**5,505**	**33,276,662**	
QATAR[e]	QGPC	• Bul Hanine, 1970	6,000	14	15			35.0
		Dukhan, 1940	6,500	116	161			41.1
		• Idd El Shargi, 1960	4,500- 8,250	25	31	282,000	4,044,985,000	35.0
		• Maydan-Mahzam, 1963	7,000	19	24			38.0
		Total Qatar		**174**	**231**	**282,000**	**4,044,985,000**	
RAS al KHAIMAH[e]	CHEVRON	• Saleh, 1983	14,500	6	6	10,000	12,831,000	50.0
		Total Ras al Khaimah		**6**	**6**	**10,000**	**12,831,000**	
SAUDI ARABIA[e]	ARAMCO	Abqaiq, 1940	6,690					37.0
		Abu-Hadriya, 1940	9,340					35.0
		Abu Jiffan	...					...
		• Abu-Safah, 1963	6,600					30.0
		Bakr	...					...
		• Berri, 1964	8,300					32.0-34.0
		Dammam, 1938	4,800					35.0
		Dhib	...					...
		Dibdibah	...					...
		Duhul	...					...
		El Haba	...					...
		Fadhili, 1949	8,050					39.0
		Farhah	...					...
		Faridah	...					...
		Ghawar, 1948	6,920					34.0
		Habari	...					...
		• Hamur	...					...
		Harmaliyah, 1971	8,430					35.0
		• Harqus	...					...
		• Hasbah	...					...
		Jaham	...					...

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Jaladi	...					...
		• Jana	...					...
		Jauf	...	588	588	4,027,000	54,147,214,000	...
		Jawb	...					...
		Juraybi'at	...					...
		• Jurayd	...					...
		• Karan	...					...
		Khurais, 1957	5,200					33.0
		Khursaniyah, 1956	6,560					31.0
		• Kurayn	...					...
		• Lawhah	...					...
		Lughfah	...					...
		• Maharah	...					...
		• Manifa, 1957	7,950					...
		• Marjan, 1967	6,800					33.0
		Mazalij	...					...
		Qatif, 1945	7,100					33.0-34.0
		Qirdi	...					...
		• Ribyan	...					...
		Rimthan	...					...
		• Safaniya, 1951	5,100					27.0
		Sahba	...					...
		Samin	...					...
		Sharar	...					...
		Suban	...					...
		Tinat	...					...
		Wari'ah	...					...
		Watban	...					...
		• Zuluf, 1965	5,800					32.0
		Total Saudi Arabia		**588**	**588**	**4,027,000**	**54,147,214,000**	
SHARJAH	CRESCENT[e]	• Mubarek,[c] 1972	...	4	4	23,460	85,659,800	37.0
	AMOCO	Saaja and Moveyid,[c] 1980	10,200-12,300	16	16	41,540	91,958,000	50.0
		Total Sharjah		**20**	**20**	**65,000**	**178,617,800**	
SPAIN	SHELL ESPANA	• Amposta Marino Norte, 1970	10,000	2	3	1,050	55,379,101	37.0
		• Tarraco (Castellon B5.8), 1973	9,000	...	3		14,547,234	35.0
	CHEVRON	Ayoluengo, 1964	4,600- 5,200	35	51	1,328	14,709,350	33.0
	REPSOL	• Casablanca, 1975	8,900	7	9	29,368	79,407,563	32.6
		• Dorada, 1975	6,700	...	4	...	16,565,228	21.5
		• Gaviota,[c] 1980	8,300	3	3	1,242	598,443	52.7
		• Salmonete, 1984	12,600	...	1	...	1,529,323	44.0
		Angula, 1984	12,600	...	1	...	46,636	44.0
		Total Spain		**47**	**75**	**32,988**	**182,782,878**	
SURINAME	STAATSOLIE	Tambaredjo, 1981	1,010	74	74	2,176	2,244,700	15.9
		Total Suriname		**74**	**74**	**2,176**	**2,244,700**	
SYRIA	AL FURAT OIL CO. SHELL	Thayyem, 1983	NA	...	...	61,450	34,629,000	36.5
		Al Kharrata, 1986	NA	...	...	380	139,000	37.5
	SPC[e]	Alian, 1974	5,900	25	37			19.0
		Gbebeh, 1976	2,300	54	75			18.0
		Jebisseh, 1968	2,000- 3,300	132	219			18.0
		Karachok, 1956	6,500	103	119	168,170	999,732,000	20.0
		Rumilan, 1962	6,500	59	66			24.0
		Soudie, 1959	6,500	532	579			24.0
		Tichrine, 1976	2,600	58	73			18.0
		Total Syria		**963**	**1,168**	**230,000**	**1,034,500,000**	
THAILAND	UNOCAL	• Erawan,[c] 1973	7,000	88	119	6,356	14,446,200	54.6
		• Baanpot,[c] 1980	7,000	20	21	438	1,180,400	54.6
		• Platong,[c] 1976	8,500	29	43	3,647	4,084,700	59.1
		• Satun,[c] 1980	8,500	56	58	4,728	4,020,500	55.1
	THAI SHELL	Sirikit, 1981	5,258- 5,976	50	61	16,180	27,865,000	41.0
		Sirikit West, 1983	5,500	2	2	500	474,000	41.0
		Pru Krathiam, 1984	...	...	2	30	11,000	19.0
		Total Thailand		**245**	**306**	**31,879**	**52,081,800**	
TRINIDAD	AMOCO	• Teak, 1971	15,191	57	97	33,861	227,983,000	29.3
		• Samaan, 1971	11,780	34	54	12,901	174,129,000	36.8
		• Poui, 1974	11,650	33	57	20,454	150,192,000	34.0
		• Cassia, 1973	12,700	7	8	6,081	10,531,000	45.0
		Mora, 1986	8,500	3	5	677	414,000	...

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
	TNA	• Soldado, 1955	11,000	354	655	37,648	462,680,000	...
		• Fortin Offshore (FOS), 1954	...	12	35	287	7,001,000	...
	TRINTOPEC	Palo Seco/Erin/McKenzie, 1926	12,718	519	1,576	8,598	117,001,000	...
		Fyzabad/Apex/Quarry, 1920	11,000	323	1,039	4,130	170,550,000	...
		Coora/Quarry, 1936	14,000	186	733	2,133	91,180,000	...
		Galeota, 1963	6,304	53	105	2,930	15,218,000	...
		Central Los Bajos, 1973	...	136	218	2,557	8,488,000	...
		Other	...	199	914	2,407	60,884,000	...
	TRINTOC	Area IV & Guapo, 1913	10,626	83	192	1,326	38,709,000	...
		Parrylands, 1913	10,626	124	508	1,667	40,127,000	...
		Point Fortin C & W, 1907	10,626	125	551	2,318	40,707,000	...
		Point Fortin E., 1929	11,000	...	168	...	26,353,000	...
		Penal, 1936	11,067	70	289	975	62,042,000	...
		Catshill, 1950	9,693	32	134	337	23,027,000	...
		Brighton, 1908	7,500	62	619	678	72,675,000	...
		Barrackpore, 1911	11,100	67	369	2,283	30,817,000	...
		Guayaguayare, 1902	10,750	107	699	1,729	86,477,000	...
		Forest Reserve, 1913	11,000	294	2,042	4,976	259,156,000	...
		Oropouche, 1944	9,100	32	128	171	6,639,000	...
		Palo Seco, 1929	12,700	87	933	2,207	93,122,000	...
		Trinity, 1956	9,700	18	95	233	15,131,000	...
		Other	...	139	813	969	80,637,000	...
	PCOL	All fields	...	99	494	645	20,568,000	...
		Total Trinidad		**3,255**	**13,530**	**155,178**	**2,392,438,000**	
TUNISIA	ELF-ETAP	• Ashtart	10,500	14	19	19,880	169,685,984	29.8
	ELF-SEREPT	Douleb/Semmama	3,937	13	15	779	17,700,000	40.0
		Tamesmida	3,937	3	3	223	2,018,000	36.9
	CFPT	Sidi El Itayem, 1971	7,500- 7,800	21	23	3,054	21,411,533	44.0
	SHELL	• Tazerka, 1979	4,111- 4,232	5	6	4,720	13,323,000	30.0
	ETAP-AGIP-FINA (SODEPS)	Makrouga, 1980	6,230	3	4	3,328	4,096,740	45.0
		Larich, 1979	7,550	2	2	102	243,372	40
		Debech, 1980	7,550	1	1	64	233,099	4
	AGIP-TUNISIA (SITEP)	El Borma, 1964	8,250- 8,900	87	113	70,580	496,300,000	42.5
		Chouech es Saida, 1971	12,600	1	1	372	2,400,000	42.9
	TENNECO	El Hajeb, 1982	6,890	2	2	980	1,010,000	30.5
		Total Tunisia		**152**	**189**	**104,082**	**728,421,728**	
TURKEY	SHELL	Barbes, 1971	4,600	17	19	1,808	15,700,000	29.7
		Baysu, 1985	3,250	3	3	578	428,000	33.3
		Bektas, 1985	3,250	1	1	246	264,000	33.7
		Beykan, 1965	2,700	37	41	3,403	58,790,000	33.2
		Cobantepe, 1975	4,000	1	1	8	176,000	32.8
		Katin, 1971	4,800	3	3	167	3,688,000	29.5
		Kayakoy, 1961	3,500	14	20	1,241	19,313,000	38.2
		Kayakoy-West, 1965	2,900	18	18	3,014	28,700,000	34.7
		Kervan, 1982	3,800	1	1	25	22,000	30.3
		Kurkan, 1962	2,125	29	31	2,467	48,465,000	31.4
		Kurkan-South, 1968	2,900	5	5	489	6,550,000	34.5
		Malatepe, 1970	2,350	14	14	941	6,522,000	32.7
		Piyanko, 1968	4,200	1	1	79	1,485,000	35.5
		Sahaban, 1966	2,900	7	10	655	12,910,000	34.5
		Sahaban South East, 1983	2,900	2	2	177	316,000	34.5
		Sincan, 1980	2,125	9	9	980	2,830,000	31.4
		Yatir-East, 1974	1,908	9	10	592	5,057,000	30.9
		Yenikoy-East, 1974	3,700	2	2	860	3,925,000	31.3
		Yesildere, 1985	3,250	2	2	366	240,000	34.7
	MOBIL	Selmo, 1964	5,800	21	21	4,451	65,323,748	34.2
		Bulgurdağ, 1961	4,500	2	3	41	2,467,145	37.9
	TPAO	Raman, 1940	4,500	82	87	4,818	48,683,893	18.7
		Bati Raman, 1961	4,200	74	85	3,396	34,037,592	13.3
		Garzan, 1956	4,700	21	21	1,460	33,115,229	26.2
		Germik, 1968	6,500	8	10	407	3,293,783	18.8
		Mağrip, 1961	5,700	10	11	681	14,591,351	18.4
		Silivanka, 1962	8,200	10	10	836	7,633,478	23.0
		Beycayir, 1976	7,700	1	1	26	186,155	26.1
		Celikli, 1964	10,500	11	12	2,408	2,955,167	35.2
		Sezgin, 1970	5,600	...	...	...	87,559	17.0
		Oyuktas, 1972	7,600	...	...	...	592,005	31.0
		Devecatak, 1973	4,800	1	1	23	222,722	37.0
		K. Osmancik, 1971	3,800	2	2	204	2,004,177	37.6
		Adiyaman, 1971	5,800	10	11	702	8,025,831	27.6
		G. Adiyaman, 1977	5,000	...	...	...	115,836	20.4
		Kuzey Adiyaman, 1977	9,500	...	...	...	59,325	32.0
		Bölükyayla, 1977	10,300	...	...	...	167,663	35.0

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Saricak, 1973	5,250	3	3	195	2,550,062	31.5
		G. Saricak, 1973	5,250	11	12	659	3,819,626	31.5
		Yenikoy, 1973	6,400	16	16	370	8,437,870	31.4
		G. Kayakoy, 1976	8,600	5	5	4,675	2,032,804	30.4
		Sivritepe, 1977	8,200	2	2	94	509,731	33.4
		Camurlu, 1976	5,600	18	18	477	863,514	12.2
		Ikiztepe, 1976	4,900	...	...	...	88,051	11.3
		G. Sahaban, 1978	5,450	13	13	1,429	2,525,466	33.2
		G. Dinrez, 1981	5,350	10	11	727	1,281,313	16.7
		B. Selmo, 1981	5,500	1	1	198	470,682	34.0
		Mehmetdere, 1982	6,700	...	...	...	149,057	31.0
		Kartaltepe, 1982	6,550	4	4	342	751,850	32.0
		Cemberlitas, 1983	6,500	18	21	4,195	6,001,201	30.5
		Alcik, 1983	6,500	1	1	24	69,399	32.0
		Cukurtas, 1985	10,000	1	1	26	200,804	36.0
		B. Kozluca, 1985	5,000	18	21	1,667	787,648	12.0
		Akpinar, 1984	10,500	2	4	141	99,062	31.6
		B. Firat, 1986	8,150	5	7	1,315	633,800	34.8
		Kurtalan, 1961	5,750	1	1	22	236,217	31.9
		S. Sinan, 1987	3,900	1	1	12	4,250	13.0
	ALADDIN MIDDLE EAST LTD.[e]	Kahta, 1958	3,500	10	13	130	4,041,000	11.0
		Yasince, 1974	6,400	2	4	10	4,650	31.0
		Total Turkey		**571**	**638**	**55,197**	**477,501,716**	
UNITED KINGDOM	AMOCO	• Montrose, 1969	8,200	16	20	11,345	74,712,198	40.5
		• NW Hutton, 1975	12,000	20	29	32,370	81,694,979	36.0
	BP	Wytch Farm Bridport Sand, 1974	2,910	11	16	6,000	13,576,000	37.0
		Wytch Farm Sherwood Sandstone, 1977	5,115					38.0
		East Midlands, 1939	3,500	71	129	1,280	24,941,994	36.0
		Kimmeridge, 1960	1,800	...	...	...	...	40.0
		Welton, 1983	5,000	14	19	2,310	1,601,240	36.0
		Nettleham, 1983	8,850	1	2	345	334,601	35.0
		• Forties and Echo, 1970	7,000	78	103	327,000	1,802,600,000	37.0
		• Buchan, 1974	8,700	9	9	21,000	59,157,572	38.0
		• Magnus, 1974	9,500	11	20	127,000	194,576,010	39.0
	BRITOIL	Thistle, 1973	9,200	33	60	56,050	316,328,503	38.5
		Beatrice (A + B), 1976	6,750	25	44	33,332	89,225,571	38.4
		Clyde, 1978	12,000	10	30	32,568	11,920,031	38.1
		Deveron, 1972	13,500	3	...	5,836	8,159,530	38.0
	CHEVRON	• Ninian, 1974	10,000	69	102	153,352	759,533,710	35.0
	CONOCO	• Statfjord,† 1974	9,500	57	88	114,623	193,754,230	39.0
		• Murchison,† 1975	9,900	20	28	52,090	182,883,940	38.0
		• Hutton, 1973	10,000	16	26	61,033	79,950,045	33.0
		• Dunlin, 1973	9,100	23	34	51,743	254,272,195	36.0
	HAMILTON BROS. OIL & GAS LTD.	• Argyll, 1971	9,000- 9,400	7	7	9,050	63,400,000	38.0
		• Duncan, 1980	9,600-10,000	3	5	4,840	16,500,000	36.0
		• Innes, 1983	12,300-12,600	2	2	2,740	4,300,000	45.0
	MARATHON	• South Brae Crude Oil, 1975	12,700-13,437	19	27	97,535	141,917,809	35.0
	MOBIL	• Beryl, 1972	9,900-11,500	43	56	91,830	355,234,746	37.4
		Ness, 1986	9,900-10,112	2	2	15,576	2,237,306	37.5
	OCCIDENTAL	• Claymore, 1974	8,100	25	27	79,233	310,655,000	30.1
		• Piper, 1973	8,100	25	27	165,396	810,261,000	37.0
		• Scapa, 1981	8,100	3	3	20,600	12,308,000	32.0
	SHELL	• Auk, 1971	NA	10	11	11,080	76,644,000	38.0
		• Brent, 1971	NA	59	66	338,900	1,060,198,000	37.8
		• Cormorant S. & C., 1972	NA	8	13	39,890	93,560,000	36.0
		• Cormorant North, 1974	NA	14	15	87,270	162,854,000	34.9
		• Dunlin A, 1973	NA	29	31	51,530	250,708,000	36.0
		• Fulmar, 1975	NA	9	14	152,240	263,468,000	40.0
	PHILLIPS*	• Maureen, 1973	8,000- 8,700	3	12	68,649	113,760,238	36.0
	TEXACO NORTH SEA	• Tartan, 1974	10,217-12,614	8	15	35,110	60,211,713	37.0-42.0
		• Highlander, 1976	8,759- 9,372	4	5	28,060	27,699,604	34.0-37.0
		• Petronella, 1975	7,269- 8,037	1	1	10,372	4,036,700	40.1
	UNOCAL	• Heather, 1973	10,800	26	37	18,512	74,501,902	34.3
*Included in Thistle total. †U.K. share of production.		**Total United Kingdom**		**787**	**1,135**	**2,417,781**	**8,052,678,367**	
VENEZUELA	PDVSA/ZULIA	Boscan, 1946	...	500	520	27,000	730,129,000	10.4
		Bachaquero, 1930	...	4,103	4,223	252,560	5,105,880,000	23.2
		Cruces-Manueles, 1916	3,000- 8,000	266	284	2,300	173,117,000	39.2

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells — Producing	No. of wells — Total	Production — 1987 average B/d	Production — Cumulative to Dec. 31, 1987 Bbl	°API gravity
	Cabimas, 1917	2,200	832	832	60,000	468,973,000	22.8
	Centro, 1959	9,600-11,000	259	279	119,000	838,640,000	36.2
	La Concepcion, 1953	3,148- 8,000	218	238	4,330	136,255,000	34.5
	La Paz, 1925	4,268- 8,000	199	199	19,000	855,108,000	30.6
	Lago, 1959	11,450	117	116	15,000	1,700,474,000	32.0
	Lagunillas, 1926	3,000	5,398	5,581	142,380	3,902,898,000	25.6
	Lama, 1957	8,320	296	310	136,000	2,445,142,000	32.5
	Lamar, 1958	13,000	220	241	65,000	189,063,000	35.5
	Mara, 1945	5,240	147	148	4,400	406,198,000	24.0
	Mene Grande, 1914	4,130	779	779	5,500	637,648,000	18.4
	Motatan, 1952	...	36	36	10,600	71,846,000	20.2
	Sibucara, 1973	13,450	10	10	402	43,406,000	30.8
	Tia Juana, 1928	3,000	3,520	3,551	221,000	10,360,221,000	18.2
	Urdaneta, 1970	10,000	40	285	23,000	122,508,000	26.7
	West-Tarra, 1942	4,250- 5,500	17	44	2,000	61,690,000	39.2
	Ceuta	...	194	203	54,000	446,771,000	30.6
	Other	...	43	124	41,300	107,205,000	...
PDVSA/ANZOATEGUI	Boca, 1971	9,500	107	112	800	79,748,000	32.2
	Caico Seco, 1946	6,500- 7,300	189	192	2,800	8,826,000	33.1
	Chimire, 1948	7,000- 7,200	267	292	4,500	257,059,000	34.6
	Dacion, 1957	6,700	159	171	5,370	223,932,000	21.6
	Elias, 1954	5,000- 6,470	249	265	6,670	424,932,000	37.5
	El Roble, 1939	3,500-11,500	70	70	2,700	38,250,000	50.0
	Guara, 1946	5,000-10,000	625	648	12,000	424,932,000	25.7
	Inca, 1948	7,250	71	72	1,000	1,545,000	28.2
	Leona, 1938	2,200-12,800	423	429	7,300	50,828,00	24.7
	La Ceiba, 1946	9,450	45	45	2,460	47,582,000	42.4
	Mata, 1954	8,970-10,516	485	547	8,800	18,310,000	32.5
	Merey, 1937	5,400- 5,700	775	790	19,700	34,938,000	12.4
	Nipa, 1945	8,000- 8,500	394	412	13,000	163,421,000	28.0
	Oscurote-Norte, 1952	9,513	83	88	700	109,739,000	19.2
	Oficina, 1937	5,900	976	1,047	10,750	381,194,000	22.6
	Soto, 1950	9,500	85	87	1,400	95,643,000	37.8
	Sta. Ana, 1936	8,500	134	143	4,400	119,683,000	42.6
	San Joaquin, 1939	6,550	137	137	5,400	108,031,000	48.8
	Sta. Rosa, 1941	8,500	242	271	13,900	390,012,000	50.4
	Yopales, 1937	4,600	390	406	11,400	127,328,000	23.6
	Zanjas, 1958	13,270	18	21	2,600	40,252,000	41.0
	Zapatos, 1955	11,500	74	83	3,600	256,253,000	35.9
	Zorro, 1953	11,100	30	36	2,000	74,630,000	35.9
	Zulus, 1957	12,710	28	29	1,250	23,286,000	42.1
	Zumo, 1954	9,200	38	41	1,300	77,486,000	26.3
	La Ceibita, 1963	9,878	56	66	2,400	64,889,000	41.8
	Adjuntas, 1957	5,000	28	717	...	...	13.9
	Arecuna	...	141	142	2,200	7,662,000	11.2
	Bare	...	279	286	1,450	15,159,000	10.1
	El Toco	...	52	53	2,000	30,111,000	52.2
	Guario	...	82	83	1,700	43,045,000	43.8
	Isla	...	26	27	2,700	57,905,000	43.5
	Other	...	70	432	14,000	392,013,000	...
PDVSA/MONAGAS	Acema, 1960	...	74	75	15,000	22,325,000	29.0
	Aguasay, 1955	8,100-13,400	17	43	4,800	14,382,000	31.3
	Jobo, 1956	3,600- 4,000	452	465	30,300	269,850,000	11.0
	Morichal, 1958	3,312	237	253	3,600	168,847,000	8.7
	Orocual, 1953	2,954	79	81	3,000	29,043,000	25.1
	Oritupano, 1950	7,657	269	279	3,400	39,681,000	19.1
	Pirital, 1958	450- 1,100	42	81	330	27,372,000	30.2
	Quiriquire, 1928	7,000- 7,200	661	671	1,150	760,239,000	23.5
	Sta. Barbara, 1941	5,020- 6,500	254	268	1,000	160,292,000	24.2
	Tacat, 1953	1,820- 3,670	151	157	150	44,691,000	18.2
	Temblador, 1936	3,500- 4,500	128	135	1,700	109,106,000	19.5
	Aguasay N.	...	60	64	6,200	5,300,000	45.4
	Acema-Casma	...	75	77	18,200	27,407,000	24.1
	Cerro Negro	...	323	324	14,500	11,541,000	8.6
	Mata Acema	...	26	26	11,000	287,667,000	24.0
	Onado	...	29	30	4,500	17,472,000	27.7
	Oritupano N.	...	38	40	5,200	23,586,000	28.4
	Pilon	...	42	147	12,000	150,505,000	12.3
	Furrial, 1985	16,000	5	5	20,000	6,660,000	28.0
	Musipan, 1985	16,500	1	1	7,000	655,000	32.0
	Other	...	20	200	5,000	120,768,000	...
PDVSA/BARINAS	Hato, 1965	9,550	13	18	2,200	43,357,000	24.4
	Maporal, 1957	10,950	15	17	2,900	15,004,000	26.7
	Paez, 1963	...	59	70	8,000	52,325,000	19.6
	Silvan, 1949	10,860	15	23	3,600	48,539,000	29.0
	Silvestre, 1948	8,860	29	58	4,300	136,253,000	23.6
	Sinco, 1953	8,500- 9,100	56	93	10,300	264,843,000	23.7
	Other	...	...	...	...	6,300,000	...

WORLDWIDE PRODUCTION

	Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/d	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
PDVSA GUARICO	Budare, 1958	4,523	55	58	2,840	66,442,000	29.6
	Las Mercedes, 1942	4,500	377	445	82	91,318,000	22.8
	Ruiz, 1949	4,500	64	90	50	33,185,000	29.9
	Barzo	4,500	12	12	10	4,005,000	29.0
	Bella Vista	4,500	91	112	40	12,347,000	21.6
	Jobal, 1960	4,500	15	16	10	2,126,000	36.3
	Saban	4,500	128	163	50	22,044,000	41.1
	Guafita, 1984	8,500	14	14	56,000	12,838,000	29.0
PDVSA AMACURO	Tucupita, 1945	...	6	96	54	67,074,000	16.6
PDVSA FALCON	All fields, 1920	500-12,000	152	165	...	107,133,000	25.0-52.0
	Total Venezuela		**28,101**	**31,115**	**1,635,488**	**36,274,363,000**	
WEST GERMANY							
WINTERSHALL A.G.[e]	Emlichheim, 1944	3,116	74	130			24.5
	Ruehlertwist, 1949	2,919	72	134			25.0
	Aldorf, 1952	4,100	48	106			33.0
	Bockstedt, 1954	4,264	34	48			27.4
	Dueste, 1954	3,936	33	71			33.0
	Pattensen, 1954	2,165	5	7			29.3
	Landau, 1955	3,936	73	78			36.9
	Sohnedeneck, 1956	5,182	19	29			27.5
	Ruelzheim, 1984	7,544	2	2			37.7
	Rheinzabern, 1959	5,576	1	1			37.9
	Moenchsrot, 1958	5,248	15	23	21,253	497,243,766	38.1
	Kirchdorf, 1982	5,737	1	1			38.5
	Oberschnarzach, 1973	4,920	4	4			37.7
	Arlesried, 1964	4,920	11	20			38.5
	Maximiliansau, 1959	5,363	1	1			41.0
	Hauerz, 1985	8,639	5	5			40.4
	Meckelfeld, 1954	6,396	21	28			27.5
	Dickel, 1953	3,936	37	60			28.3
	Nienhagen, 1925	3,729	12	12			30.0
	Wathlingen, 1939	2,624	8	9			30.0
	Eicklingen, 1937	2,460	12	13			30.0
	Schwabmuenchen, 1976	4,428	1	1			25.7
	Aitingen, 1977	6,232	4	4			31.1
OTHER OPERATORS[e]	Scheerhorn, 1949	3,550- 3,750					30.0
	Reitbrook, 1937	1,450- 2,100					29.0
	Oelheim-Sued, 1968	7,650	932	1,630			33.0
	Sinstorf, 1960	6,750- 7,150					...
	Vorhop, 1952	2,950- 6,900					36.0
DEUTSCHE TEXACO AG	Boostedt, 1952	5,900	25	41	662	18,178,547	32.0
	Ploen-Ost, 1958	8,850	31	62	1,160	50,716,673	33.0
	Preetz, 1962	8,200	19	30	345	11,527,580	26.0
	Schwedeneck-See, 1978	4,900	15	15	7,749	7,617,042	28.0
	Hankensbuettel-Sued, 1954	4,900	43	82	2,376	81,818,047	27.0-35.0
	Hardesse, 1957	8,200	31	69	549	8,667,754	40.0
	Oerrel-Sued, 1954	4,600	24	46	1,081	11,404,076	26.0
	Hohne, 1951	5,250	29	55	834	40,639,319	33.0
	Lieferde, 1956	2,600	22	42	348	20,261,379	33.0
	Wesendorf, 1943	4,650	18	36	304	17,394,007	25.0-40.0
	Mittelplate, 1987	7,500- 9,350	4	4	836	305,271	19.3
	Other, 1935	2,300- 8,200	27	69	518	30,513,974	19.0-37.0
MOBIL ERDGAS-ERDOL GMBH (MEEG)	Hofolding, 1980	11,100	2	3	468	581,148	28.0-30.0
	Bavaria	4,660- 6,190	2	31	1	7,526,952	20.0-25.0
	Hannover	980- 6,630	46	70	859	28,243,280	25.0-31.0
	Viogtei, 1953	980- 1,900	77	106	633	25,923,571	32.0-34.0
	Sud-Oldenburg, 1950	2,630- 6,800	76	153	1,187	39,518,517	31.0-39.0
	Weser Ems	2,000- 2,450	16	25	260	5,984,259	24.0
BEB	Annaveen, 1963	1,428	3	4	17	490,240	33.8
	Barenburg, 1953	2,706	45	73	2,240	38,862,348	31.1
	Barver, 1963	3,640	3	5	39	484,081	32.8
	Dodenteich, 1960	4,541	1	2	15	350,491	31.1
	Eich, 1983	5,995	5	8	725	780,891	38.9
	Eilte-West, 1956	6,051	13	16	94	3,526,095	32.8
	Eldingen, 1949	5,028	38	45	275	20,659,451	35.5
	Elsfleth, 1956	5,175	3	13	44	2,843,467	25.7
	Eystrup 3-6, 1959	1,075	4	4	149	1,109,904	17.4
	Eystrup 2, 1960	3,526	1	1	14	440,007	17.4
	Eystrup-Verden, 1977	3,526	1	4	7	172,143	17.1
	Georgsdorf, 1943	2,653	212	369	5,600	100,618,330	23.8
	Gross-Lessen, 1969	3,280	7	11	834	21,223,931	29.8
	Hankensbuttel, Mitte, 1954	5,182	6	8	158	4,280,434	33.0
	Hankensbuttel-Nord, 1955	5,182	4	4	327	6,242,108	33.0
	Hankensbuttel, Ost, 1954	5,182	1	1	55	1,254,636	33.0
	Hebelermeer, 1955	3,899	10	15	130	4,492,425	27.3

WORLDWIDE PRODUCTION

		Name of field, discovery date	Depth, ft	No. of wells: Producing	No. of wells: Total	Production: 1987 average B/D	Production: Cumulative to Dec. 31, 1987 Bbl	°API gravity
		Hillerse-Nord, 1958	2,683	1	1	7	764,693	31.5
		Hillerse-West, 1957	6,077	1	1	3	28,790	43.1
		Hohenassel, 1943	1,705	13	28	43	3,511,514	30.4
		Hohnebostel, 1969	8,341	3	6	70	1,181,756	41.0
		Königsgarten, 1984	6,235	0	3	108	63,854	38.1
		Lingen-Dal. (incl. Wd), 1942	3,129	89	148	216	16,882,629	31.1
		Lüben, 1955	4,100	8	11	749	11,998,436	33.0
		Lüben-West, 1958	4,690	5	6	147	1,463,259	36.9
		Meerdorf, 1954	6,077	16	27	99	1,593,134	43.1
		Meppen-Schwefingen, 1959	4,257	22	24	937	12,134,969	29.8
		Mölme-Feldbergen, 1934	1,410	2	2	11	508,466	31.1
		Mölme-Wachtel, 1934	3,886	2	18	2	758,642	38.9
		Nienhagen, 1909	3,079	8	30	107	26,835,081	29.6
		Nienhagen-Dachtmissen, 1959	3,427	6	8	90	998,833	27.8
		Pfullendorf-Ostrach, 1962	3,558	15	24	129	2,498,576	37.7
		Pötrau, 1959	5,248	...	2	...	30,187	14.3
		Rühlermoor-Malm, 1962	4,519	4	10	121	6,408,949	31.7
		Rühlermoor-Valendis, 1949	2,381	283	453	9,069	132,109,053	24.6
		Rühme, 1954	2,361	39	48	740	10,468,482	33.4
		Steimbke-Alt + Nord, 1935	1,246	29	41	102	7,698,424	20.6
		Steimbke-Lichtenmoor, 1943	2,722	17	34	124	3,885,967	17.4
		Steimbke-Ost, 1959	4,428	4	11	51	3,798,042	30.5
		Stockstadt, 1952	5,402	9	22	119	7,721,109	39.6
		Suderbruch, 1949	5,175	49	73	527	23,336,008	31.1
		Sulingen, 1973	3,345	9	9	553	5,036,459	30.0
		Varel, 1957	5,084	6	15	135	5,712,723	25.5
		Varloh, 1984	4,129	6	6	226	118,388	31.5
		Volkensen, 1960	7,540	4	5	75	743,953	22.9
		Wald, 1966	3,116	...	4	...	51,025	28.2
		Wehrbleck, 1957	3,342	56	67	722	16,289,366	32.0
		Wietingsmoor, 1954	2,820	24	32	540	12,968,076	30.5
	DST	Bramberge, 1958	2,600	58	73	6,075	101,649,164	28.0
		Fronhofen, 1964	3,800	9	15	238	2,360,472	37.0
		Illmensee, 1967	3,800	2	6	39	983,981	37.0
		Memmingen-M, 1958	5,000	...	7	...	446,484	37.0
		Markdorf, 1960	7,700	...	1	...	13,912	37.0
		Total West Germany		**3,088**	**5,210**	**74,800**	**1,535,219,000**	
YEMEN, NORTH	HUNT OIL	Alif, 1984	5,700	12	76	18,800	9,514,000	40.0
		Azal, 1987	6,850	...	9	...	...	40.0
		Total North Yemen		**12**	**85**	**18,800**	**9,514,000**	
ZAIRE	CHEVRON	• GCO, 1970	7,000- 9,000	6	8	244	6,228,697	29.0
		• Mibale, 1973	5,000- 6,000	7	8	13,874	81,266,684	30.0
		• Mwambe, 1979	6,150	2	2	174	638,862	30.4
		• Motoba, 1976	11,098	4	4	2,848	1,693,960	44.3
		• Lukami, 1983	12,400	3	5	3,336	6,170,507	35.0
		• Libwa, 1981	5,500	...	2	...	...	33.0
	ZAIREP (FINA)	East Mibale, 1978	6,000	...	1	...	397,637	34.0
		Kinkasi, 1972	3,700	40	42	3,134	6,287,706	31.0
		Liawenda, 1972	3,900	27	32	2,056	4,764,380	31.0
		Nsiamfumu, 1977	8,300	...	1	...	5,347	34.0
		Kifuku, 1983	3,400	1	1	25	37,588	31.0
		Makelekese, 1983	3,600	8	8	491	737,007	31.0
		Muanda, 1972	3,600	6	6	547	536,119	31.0
		Tshiende, 1978	6,000	6	7	4,693	3,930,966	34.0
		Total Zaire		**110**	**127**	**31,372**	**112,695,560**	

USSR

Field, year discovered	No. wells	1988 prod. (million bbl)	Cum. prod. 1-1-89 (million bbl)	Pay, ft.
Arlan, 1955	4,000	50	2,500	Carb., 4,429
Baku Archipelago, 1963	250	20	490	Pliocene, 8,773
Fedorovskoye, 1971	2,500	245	2,645	L. Cret., 5,900
Kholmogorskoye, 1973	1,100	80	630	L. Cretaceous
Mamontovo, 1965	2,000	195	2,425	Cretaceous, 6,300
Neftianye Kamni, 1949	1,110	15	1,130	Pliocene, 5,406
Pravdinsk, 1964	800	45	965	L. Cret., 9,580
Romashkino, 1948	8,000	310	14,310	Devonian, 5,791
Samotlor, 1965	7,500	780	14,805	L. Cret., 7,316
Sovetskoye, 1962	500	38	958	Cret., 11,130
28th of April, 1979	80	44	154	Pliocene, 11,000
Usa, 1963	1,250	70	1,000	Paleozoic, 6,510
Ust-Balyk, 1961	1,400	65	1,725	L. Cret., 8,845
Uzen, 1961	2,200	70	1,695	Jurassic, 2,667

U.S. fields with reserves exceeding 100 million bbl

State	Field	Disc. date	1988 prod.	Cum. prod. 1-1-89	Est. rem. reserves	Est. No. wells
			1,000 bbl			
ALABAMA						
	Citronelle	1955	1,827	147,861	7,000	435
ALASKA						
	Endicott	1978	36,098	43,098	324,902	37
	Granite Point	1965	2,787	109,535	16,213	29
	Kuparuk River	1969	112,055	503,397	994,945	328
	Lisburne	1967	14,600	35,600	175,689	49
	McArthur River	1965	7,040	529,040	34,960	76
	Middle Ground Shoal	1962	2,737	155,889	5,263	42
	Prudhoe Bay	1967	576,335*	6,053,018†	3,533,665	691
	Swanson River	1957	2,154	209,490	8,846	29
ARKANSAS						
	Smackover	1922	2,664	556,907	9,097	2,100
CALIFORNIA						
San Joaquin Valley						
	Belridge South	1911	60,583	677,083	435,286	6,000
	Buena Vista	1909	1,574	647,274	38,271	895
	Coalinga	1890	10,212	753,845	161,188	2,174
	Coalinga Nose	1938	1,285	498,685	17,370	78
	Coles Levee North	1938	442	160,432	2,748	85
	Cuyama South	1949	469	218,191	6,938	105
	Cymric	1909	8,479	199,308	40,000	1,013
	Edison	1928	1,470	134,391	26,670	674
	Elk Hills	1911	39,144	893,374	579,776	1,099
	Fruitvale	1928	577	115,553	13,709	274
	Greeley	1936	237	112,647	1,763	27
	Kern Front	1912	1,500	173,066	55,230	950
	Kern River	1899	46,899	1,204,479	743,000	6,709
	Kettleman North Dome	1928	172	456,648	1,298	44
	Lost Hills	1910	5,627	178,293	61,603	1,634
	McKittrick	1896	2,551	266,822	90,919	931
	Midway-Sunset	1894	57,497	1,879,347	373,863	9,180
	Mount Poso	1926	6,620	263,250	79,280	411
	Rio Bravo	1937	151	116,051	1,319	15
	Yowlumne	1974	6,570	81,368	27,015	65
Coastal Area						
	Carpinteria	1966	2,690	88,101	29,289	114
	Cat Canyon E. & W.	1908	2,736	288,236	46,930	512
	Dos Cuadras	1969	4,371	212,804	54,140	140
	Elwood	1928	317	105,705	2,283	7
	Hondo	1969	9,952	89,621	112,223	20
	Orcutt	1901	906	165,874	10,238	136
	Point Pedernales	1982†	6,515	11,715	331,544	10
	Rincon	1927	1,118	148,759	14,832	240
	San Ardo	1947	4,641	408,351	122,903	600
	Santa Maria Valley	1934	1,751	198,131	40,408	172
	South Mountain	1916	727	145,984	12,035	352
	Ventura	1919	7,072	894,742	97,026	570
Los Angeles Basin						
	Beta	1976	6,013	40,423	173,825	60
	Beverly Hills	1900	2,034	122,616	42,356	116
	Brea-Olinda	1880	2,143	383,894	54,787	720
	Coyote East	1909	584	108,663	13,212	103
	Coyote West	1909	808	249,969	7,481	113
	Dominguez	1923	607	269,266	7,448	113
	Huntington Beach	1920	5,816	1,066,368	72,044	990
	Inglewood	1924	2,790	345,453	54,149	366
	Long Beach	1921	2,466	909,757	17,216	410
	Montebello	1917	526	192,357	10,267	155
	Richfield	1919	1,494	189,165	27,412	203
	Santa Fe Springs	1919	987	613,077	9,036	151
	Seal Beach	1924	876	203,118	14,118	168
	Torrance	1922	1,693	212,083	35,847	366
	Wilmington	1932	29,921	2,292,229	495,633	2,050
COLORADO						
	Rangely	1933	12,492	739,418	35,000	488

State	Field	Disc. date	1988 prod.	Cum. prod. 1-1-89	Est. rem. reserves	Est. No. wells
			1,000 bbl			
FLORIDA						
	Jay	1970	4,676	360,612	55,944	121
ILLINOIS						
	Clay City	1938	2,448	393,860	6,000	2,600
	Lawrence	1906	2,919	394,521	5,500	2,700
	Louden	1938	1,345	388,237	3,555	1,340
	Main	1906	2,066	233,273	5,000	3,356
	New Harmony	1939	1,072	153,545	4,000	1,140
	Salem	1938	2,167	386,983	4,500	1,325
KANSAS						
	Bemis-Shutts	1928	1,169	244,247	4,405	973
	Chase-Silica	1930	1,018	301,003	4,499	1,103
	El Dorado	1915	839	296,734	2,616	822
	Hall-Gurney	1931	1,032	145,677	4,051	1,130
	Trapp	1929	1,200	225,888	4,643	1,000
LOUISIANA						
Offshore						
	Bay Marchand Blk. 2	1949	5,547	596,972	53,758	120
	Eugene Island Blk. 330	1930	7,859	269,080	55,920	169
	Grande Isle Blk. 16	1948	1,659	263,729	85,645	44
	Grande Isle Blk. 43	1956	4,312	272,256	85,688	126
	Mississippi Canyon Blk. 194	1980	4,929	116,868	76,311	44
	Main Pass Blk. 41	1957	2,985	237,854	23,384	112
	Main Pass Blk. 306	1969	1,776	201,869	78,335	94
	South Pass Blk. 27	1954	1,659	125,317	73,198	118
	South Pass Blk. 61	1968	8,140	152,151	45,000	156
	South Pass Blk. 62	1965	3,331	106,364	81,594	73
	South Pass Blk. 65	1969	4,032	100,875	89,252	61
	Ship Shoal Blk. 204	1968	1,591	66,070	38,930	40
	Ship Shoal Blk. 207	1967	1,023	87,818	38,000	25
	Ship Shoal Blk. 208	1962	4,117	160,169	65,274	67
	South Timbalier Blk. 21	1939	1,324	216,239	47,133	45
	South Timbalier Blk. 135	1956	1,390	139,337	25,663	37
	West Delta Blk. 30	1949	6,754	446,083	47,375	153
	West Delta Blk. 73	1962	4,469	188,700	86,291	73
Onshore South						
	Bay de Chene	1941	390	96,382	17,952	24
	Bay St. Elaine	1928	321	164,808	25,292	18
	Bayou Sole	1941	769	161,369	3,417	20
	Black Bay West	1959	1,971	144,799	10,432	94
	Caillou Island	1930	2,308	602,231	74,020	136
	Cote Blanche Bay West	1940	741	181,594	46,374	86
	Delta Farms	1944	293	115,351	7,019	13
	Garden Island Bay	1934	1,406	221,261	31,954	144
	Golden Meadow	1938	894	135,439	4,290	176
	Grand Bay	1938	454	170,514	3,760	41
	Hackberry, East	1927	777	109,087	7,603	60
	Hackberry, West	1928	1,771	141,895	6,492	107
	Iowa	1931	134	99,303	697	25
	Jennings	1901	315	116,409	700	181
	Lafitte	1935	1,665	255,304	9,550	111
	Lake Barre	1929	941	204,023	20,061	31
	Lake Pelto	1929	477	117,000	17,415	23
	Lake Washington	1931	2,353	242,390	16,376	93
	Leeville	1931	447	141,646	7,221	37
	Paradis	1939	725	126,650	8,600	31

*Includes about 30.66 million bbl of condensate. †Includes about 138.66 million bbl of condensate.

State Field	Disc. date	1988 prod.	Cum. prod. 1-1-89	Est. rem. reserves	Est. No. wells
			1,000 bbl		
Quarantine Bay	1937	761	172,672	1,654	71
Venice	1937	858	181,878	7,590	59
Vinton	1910	287	161,001	800	96
Weeks Island	1945	816	225,939	21,356	33
West Bay	1940	1,349	228,246	16,355	79
North Caddo-Pine Island	1905	3,310	360,899	12,888	10,688
Delhi	1944	673	211,707	34,651	58
Haynesville	1921	761	168,237	2,373	166
Homer	1919	434	98,375	1,908	198
Rodessa	1935	331	106,027	1,506	67
MISSISSIPPI					
Baxterville	1944	2,609	239,164	10,391	316
Heidelberg	1944	2,829	174,809	12,171	316
Tinsley	1939	834	29,677	3,197	173
MONTANA					
Bell Creek	1967	958	128,836	22,984	91
Cut Bank	1926	994	162,459	37,169	575
Pine	1951	1,302	105,145	5,687	96
NEW MEXICO					
Denton	1949	652	138,693	3,000	179
Empire-Abo	1957	1,424	219,983	50,017	405
Eunice-Monument	1929	2,500	125,414	10,894	879
Hobbs	1928	8,480	297,482	20,000	613
Maljamar	1926	1,869	144,961	5,070	851
Vacuum	1929	12,359	432,242	40,000	1,556
NORTH DAKOTA					
Beaver Lodge	1951	1,704	111,574	16,684	132
Billings Nose	1978	2,560	61,669	51,744	153
Little Knife	1977	3,392	51,437	57,924	131
Mondak	1976	439	13,165	82,887	96
OKLAHOMA					
Burbank	1920	1,135	536,746	8,377	1,105
Eola-Robberson	1920	746	133,124	8,210	603
Fitts	1934	2,963	199,894	12,000	589
Glenn Pool	1905	1,170	327,865	5,000	714
Golden Trend	1945	4,333	474,100	28,000	1,396
Healdton	1913	1,938	334,645	9,563	1,000
Hewitt	1919	3,152	268,371	13,615	923
Oklahoma City	1928	802	816,170	5,966	174
Postle	1958	1,216	106,393	14,921	226
Sho-Vel-Tum	1905	18,398	1,167,379	60,000	7,616
Sooner Trend	1945	4,147	295,544	20,000	4,746
TEXAS					
District 2					
Greta	1933	748	147,570	12,530	100
Lake Pasture	1953	2,184	87,784	12,644	143
Tom O'Connor	1934	10,380	747,848	55,000	646
West Ranch	1938	2,640	380,034	8,504	307
District 3					
Anahuac	1935	1,068	284,888	15,112	106
Conroe	1931	3,864	727,215	33,728	278
Giddings	1971	8,868	278,570	148,032	2,281
Hastings	1934	3,084	697,237	72,764	206
Magnet Withers	1936	1,884	110,960	5,000	150
Oyster Bayou	1941	864	160,204	18,096	39
Thompson	1931	3,972	472,540	27,360	262
Tomball	1933	400	121,056	9,868	86
Webster	1937	5,304	573,192	20,000	243
District 4					
Agua Dulce-Stratton	1928	360	146,623	24,751	94
Borregos	1945	192	114,021	20,186	40
Kelsey	1938	200	114,859	36,247	60
Plymouth	1925	400	122,823	3,300	60
Seeligson	1925	156	271,483	55,544	42
TCB	1944	456	112,700	52,358	30
White Point E.	1938	60	104,034	6,340	21
District 5					
Alabama Ferry	1983	3,600	14,600	86,400	253
Van	1928	3,096	521,960	15,000	366
District 6					
East Texas	1930	40,597	5,008,747	988,758	9,363
Fairway	1960	2,424	192,691	17,777	100
Hawkins	1940	8,244	821,644	42,372	442
Neches	1953	1,416	103,980	6,036	163
Quitman	1948	1,680	121,346	8,440	208
District 8					
Andector	1946	1,500	181,888	6,500	28
Block 31	1945	3,556	220,068	12,000	325
Cowden, N.	1930	13,596	488,092	40,000	1,210
Cowden, S. Foster, Johnson	1932	9,696	500,796	40,000	1,593
Dollarhide	1945	2,568	193,780	11,448	202
Dune	1938	2,928	183,000	18,704	771
Fullerton	1942	7,452	348,200	22,000	870
Goldsmith	1934	7,248	755,516	33,752	2,036
Howard Glasscock	1925	5,844	404,508	26,000	2,208
Iatan, E.	1926	3,372	142,956	12,000	1,304
Jordan	1937	480	128,976	2,520	138
Keystone	1930	1,872	313,080	9,374	812
McElroy	1926	7,884	465,549	56,800	1,600
Means	1934	7,020	228,598	20,000	713
Midland Farms	1944	4,608	241,980	18,616	415
Sand Hills	1931	2,760	248,207	21,600	1,312
TXL	1944	2,004	263,516	6,500	600
Waddell	1927	708	100,712	3,792	188
Ward Estes, N.	1929	3,408	364,177	76,436	1,562
Westbrook	1923	2,000	88,000	16,000	718
Yates	1926	33,540	1,171,820	782,685	1,146
District 8-A					
Anton-Irish	1944	3,564	175,910	24,190	239
Cogdell Area	1949	1,656	292,218	41,204	103
Diamond M.	1948	1,908	239,418	16,063	474
Kelly-Snyder	1948	11,592	1,234,962	115,038	806
Levelland	1938	17,328	484,144	50,000	3,012
Prentice	1951	6,216	161,036	20,000	437
Salt Creek	1950	10,404	247,340	12,552	173
Seminole	1936	17,004	524,768	36,000	624
Slaughter	1936	20,364	1,029,800	50,000	3,001
Spraberry Trend	1951	22,212	653,388	50,000	7,321
Wasson	1936	28,656	1,711,898	60,000	2,152
Welch	1942	3,324	144,228	14,000	651
District 10					
Panhandle	1921	7,812	1,423,286	41,240	11,643
UTAH					
Altamont	1955	3,047	89,493	231,216	227
Aneth	1956	5,340	354,004	30,000	461
East Anschutz Ranch	1979	12,756	80,365	727,799	28
Red Wash	1951	1,075	77,511	13,377	146
WYOMING					
Brady	1960	2,438	54,637	49,251	22
Byron	1918	1,119	120,688	7,656	67
Elk Basin	1915	2,968	446,698	25,750	170
Frannie	1928	1,122	116,020	5,000	63
Garland	1906	2,625	154,885	6,000	225
Grass Creek	1914	2,414	185,120	9,000	288
Hamilton Dome	1918	2,853	268,109	6,000	239
Hartzog Draw	1976	6,647	66,722	283,739	157
Hilite	1969	541	75,416	55,885	93
Lance Creek	1918	163	107,805	400	24
Little Buffalo Basin	1914	2,666	118,653	9,389	154
Lost Soldier	1916	2,308	192,073	6,000	71
Oregon Basin	1912	8,669	388,180	30,000	500
Painter Reservoir	1979	1,739	31,674	80,674	31
Salt Creek	1906	5,210	629,689	25,000	1,217
Wertz	1920	3,500	99,695	15,000	65
Whitney Canyon	1980	1,652	10,379	105,485	29

According to Texaco, the discovery is located 170 miles southeast of Guangzhou in the Pearl River Basin and about 15 miles southwest of the Huizhou 21-1 oilfield.

At the end of the year, Texaco was still evaluating the test results and other data achieved from the Huizhou 26-1-1. The consortium, comprised of Texaco, Agip and Chevron, said additional drilling will begin through this year to determine the potential of the prospect.

While one analyst described the prospect as an "incredibly good well," an expert on China's offshore sector warned that any development in the area would be extremely costly.

"This well tested from seven zones and multiple zone completions are very complex," said Dr. Kim Woodard, president of Washington D.C.-based China Energy Ventures. "This is a history of discontinuity in the structures offshore China. There is a lot of fracturing in the fields there."

Traps questionable

He said the biggest question mark hanging over China is the type of trap structure found offshore. He said most of the traps in China are stratigraphic, and if this structure continues offshore, it could pose development problems.

"The problem you have with wildcats there is the discovery well looks good and then the step-outs tend to drop down. This is a nice hit, but I don't feel we're ready to go out and say we have another Persian Gulf," he said.

Many China watchers believe the Bohai Sea may someday replace the South China Sea as the center of the nation's offshore activity.

Much of that projection centered around Bohai Oil Corp's SZ36-1 discovery in Liaodong Bay, about 31 miles offshore Jinxi. Water depth in the region averages 98 ft. The Chinese have since indicated 300 to 400 wells may be drilled over the next decade to evaluate and develop the structure.

At the end of last year, eight wells had been drilled there, which led some Chinese bureaucrats to say the field could hold at least 879 million bbl of oil.

This year, Bohai Oil said it would like to begin drilling several wells on its Jz20-2 gas/condensate field in the northernmost fringes of Liaodong Bay in the Bohai. The exact number of wells was not released.

China estimated reserves in that structure to be 706 bcf of gas, 22 million bbl of condensate and 73 million bbl of oil. That field could be on stream by 1991.

Elsewhere, Indian state company ONGC outlined plans last year to substantially increase its offshore production, especially in the much explored Bombay High region.

The company said late last year that it has devised a plan to increase total Bombay High oil output from 146 million bbl to 197.91 million bbl during the next eight plan period (1990-1995). ONGC sources said the company plans to concentrate on newly discovered fields in the Bombay offshore region. To that end, ONGC invited bids in December for a turnkey 3D seismic program in the Krishna Godavari basin. The survey is to begin in April 1989 and continue for one year. It will be carried out between Kakinada and Surasanyanam covering between 2,000 to 3,000 line km.

Last December, ONGC recorded a new gas discovery off the East Coast near Kakinada. It marked the 10th well drilled in the Ravva structure in the Krishna-Godavari basin.

ONGC's Bombay region early this year was scheduled to secure two drillships to work from mid-September until May 1990, and then resume work from mid-September 1990 until May 1991.

Hibernia finally underway

All the attention on Canada's east coast will be directed this year to the mammoth Hibernia project, which finally got underway last year - nine years after its discovery.

The development program will involve a concrete gravity-base structure, two articulated loading platforms, and three ice-strenghtended shuttle tankers. The earliest possible start-up date for production is 1993, according to operator Mobil. An agreement to finally proceed with the project was signed late last summer by the Hibernia consortium and the Canadian provincial and federal governments.

The field is located 315 km east of St. John's in 80 meters of water. Total development cost is about $7 billion.

Betting oil prices will increase and stabilize in six years, the Canadian government, in an unprecedented move, agreed to contribute $830 million in grants and up to $1.3 billion in loan guarantees to get the long-delayed platform in the water. Most of the contracts for the giant structure are to have been awarded by mid-1989.

In agreeing to help fund the project, the Canadian government is predicting healthy oil prices by the mid-1990's when first oil is expected to flow from the estimated 500-million-bbl field. A price of $20/bbl is required for the field to be profitable. OGJ

Offshore production systems planned, installed in '88

Operator / Platform name	Fabrication yard Location	Type or Function (No. legs/main piles/skirt piles)	Water Depth/No. Well Slots	Install. Date
U.S. GULF OF MEXICO (45)				
Amoco				
	Jacket (4/-/-)	NA	6/	Design
	South Timbalier 221		155	NA
A	Jacket (4/-/-)	NA	12/	Planned
	South Timbalier 245		NA	NA
Anadarko Petroleum				
	Jacket (4/-/-)	NA	NA	Pending
	Vermillion 78 A		NA	NA
Arco				
	Well Protector (1)	Apex	1	Construction
	Main Pass 128		95	NA
	Jacket (4/-/-)	Raymond-	6/	Construction
	Main Pass 129	McDermott-Zachry	74	NA
Chevron				
	Jacket (4/-/-)	NA	0/	Bidding
	Main Pass 69 M		14Feb.	89
	Jacket (4/-/-)	NA	0/	Design
	Ship Shoal 108 D		3589	
	Jacket (satellite) (4/-/-)	NA	6/	Design
	Ship Shoal 100 DA		2289	
	Jacket (caisson) (-/-/-)	NA	3/	Design
	West Cameron 555		185	89
	Jacket (caisson) (-/-/-)	NA	3/	Design
	East Cameron 298		180	89
AA	Jacket (satellite) (4/-/-)	NA	6/	Design
	Main Pass 299		210	NA
A	Jacket (satellite) (4/-/-)	NA	4/	Design
	Matagorda Island 784		183	NA
	Jacket (3/3/1)	NA	1/	Fabrication

Offshore production systems planned,installed in '88 — continued

Operator Platform name	Fabrication yard Location	Type or Function (No. legs main piles skirt piles)	Water Depth No. Well Slots	Install. Date
	South Timbalier 35 #6		50	NA
	Jacket (caisson)	NA	3	Fabrication
	South Marsh Island 48		100	Nov. 88
Conoco				
	Tension Leg Well Platform, Green Canyon 184	NA	24 1,850	Design 89
	Jacket (4--) Canyon 52	NA	NA 615	Design 89
A	Jacket (16--) Green Canyon 184	NA	24 NA	Planned NA
Corpus Christi Oil & Gas				
	Jacket (----) Main Pass 98	NA	NA NA	Planned NA
Exxon				
Alabaster	Jacket (----) Miss. Canyon 397	NA	NA NA	Design NA
	Well Protector (4--) NA	McDermott Morgan City, LA	6 51	Fabrication NA
Forest Oil				
EI 325	Jacket (--4) NA	NA 25589	12	Design
EI 326	Jacket (--4) NA	NA 25589	6	Design
EI 366	Jacket (--4) NA	NA 34589	12	Design
SS 277	Jacket (--4) NA	NA 21489	12	Design
Hall-Houston				
A	Jacket (4--) Main Pass 165	NA	8 NA	Construction NA
Kerr-McGee				
	Well Protector (4--)	Apex Offshore	3	In progress
Maxus				
	Jacket (4--) Main Pass 31	NA	0 15	Planned 2nd Qtr 88
Mobil (Moepsi)				
	Well protector (-3-) West Cameron 533-B	NA 175Apr. 89	2	Design
	Jacket (-4-) Vermilion 271-A	NA 165Jun. 89	3	Design
	Jacket (-4-) Vermilion 326-A	Gulf Island 219Nov. 88	6	Fabrication
	Jacket (-4-) West Cameron 421-A	NA 98Feb. 89	NA	Design
	Jacket (-4-) S. Marsh Island 205-A	McDermott 442Nov. 89	9	Fabrication
	Vermilion 326-A		217	Dec. 88
	Jacket (8--) Mobile Bay 95-E	McDermott	8 23	Installed Pending
Pelto Oil Co.				
	Jacket (4--) Main Pass 95	NA	4 60	Under study NA
Samedan				
	Jacket (4--) Eugene Island 248	NA	6 160	Fabrication NA
3 Units	Jacket (4--) Brazos A-52, A-53	NA	0 NA	Fabrication NA
Shell				
C SS 274	Jacket (8 0-) NA	Avondale 218NA	24 NA	
A MP 252	Jacket (4 4-) NA	McDermott 272NA	24 NA	
JA PN 969	Jacket (4 0-) NA	McDermott 140NA	9 NA	
1 MB 113	Well Protector (4 0-) NA	NA 23NA	3 NA	
2 MB 132	Well Protector (4 0-) NA	NA 39NA	3 NA	
Tenneco Oil				
HI 128 #1	Jacket (caisson) (1--) NA	NA 50NA	1	Bid phase
WC 168A	Jacket (4--) NA	NA 46NA	1	Bid phase
Walter Oil & Gas				
	Jacket (-2-) Vermilion 95 A	McDermott 27	1	Fabrication 4th Qtr. 88

U.S WEST COAST (13)

Operator Platform name	Fabrication yard Location	Type or Function (No. legs main piles skirt piles)	Water Depth No. Well Slots	Install. Date
Arco				
Coal Point	Jacket (8--) Santa Barbara, CA	NA	NA 218	Design NA
	Jacket (12--) Complex Heron Santa Barbara chnl	NA	NA 220	Planned NA
	Jacket (12--) Complex Heron Santa Barbara Chnl	NA	0 220	Planned NA
	Two Units (8--) Complex Hawk Santa Barbara Chnl	NA	NA 220	Planned NA
Chevron				
Hermosa	Jacket (8--) Point Arguello field	Hitachi Ariake	48 NA	In progress NA
Rocky Point Unit	Jacket (----) Off Point Arguello	NA	NA 300	Under study NA
Hacienda	Jacket (----) Point Arguello field	NA	48 308	Planned Summer 89
Exxon				
	Jacket (8--) Point Pedernales OCS-P-0438, 0440	NA	60 281	Design NA
	Jacket (8--) Santa Ynez Unit OCS-P-0190	NA	60 1,200	Design NA
	Jacket (8--) Santa Ynez Unit	NA	60 1,075	Design NA
Independence	Jacket (8--) Santa Maria basin	Wakamatu Kita-Kyushu Japan	NA NA	Suspended NA
Shell				
Hercules	Jacket (8--) Molino field Santa Barbara Channel	NA	NA 237	Awaiting permit NA

NORTH SEA (40)

Operator Platform name	Fabrication yard Location	Type or Function (No. legs main piles skirt piles)	Water Depth No. Well Slots	Install. Date
Amoco				
HOD	Jacket (4--) NA	NA 23090	8	Under study
Arco				
	Jacket (4 4 0) West Cameron 248	9 Design NA 80NA		
Britoil				
Amethyst	Jacket (quarters) (8--) UK 47 14	NA	0 90	Under study NA
Ettrick	Floating Production UK 20 2	NA	NA 360	Under study NA
British Petroleum				
Gyda	Jacket (6--) Norway	Not awarded	30 216	Planned 2nd Qtr 89
Bruce	Jacket (----) UK	NA	NA 394	Under study NA
Miller	Jacket (8--) UK	NA	NA 354	Under study NA
Elf Petroland				
L7-H	Jacket (4 4 0) NA	ETPM Lummus 100Jul. 89	6	Fabrication
HGB Ltd.				
DP6	Jacket (4 12-) UK Blk 110 2a	Contract not awarded	14 85	Design Spring 89
DP8	Jacket (4 12-) UK Blk 110 2a	Contract not awarded	14 85	Design Spring 89
Hamilton Bros.				
	Jacket (----) UK Bruce field	NA	NA NA	Under study 90

Offshore production systems planned, installed in '88 — continued

Operator Platform name	Fabrication yard Location	Type or Function (No. legs main piles skirt piles)	Water Depth No. Well Slots	Install. Date
Hydrocarbons GB Ltd.				
DP6	Jacket (4---)	NA	14	Fabrication
Morecambe Bay		85Spring 89		
DP8	Jacket (4---)	NA	14	Fabrication
Morecambe Ba,		85Spring 89		
Maersk (A. P. Moller)				
	Wellhead (----)	NA	NA	Planned
	Danish Roar field		NA	89
	Jacket (processing) (---)	NA	NA	Planned
	Danish Roar field		NA	89
Mobil Producing Netherlands				
	Jacket (----)	NA	4	Under study
	The Netherlands. P.12-SW	9091		
	Jacket (----)	NA	4	Under study
	The Netherlands P.12-C	9091		
NAM				
L	Jacket (satellite) (----)	NA	NA	Planned
	Dutch Ameland field		26	89
FB	Jacket (satellite) (----)	NA	4	Planned
	Dutch K.8		102	89
FA	Jacket (----)	NA	8	Planned
	Dutch L.2		118	90
Norsk Hydro				
Oseberg B	Jacket (----)	NA	NA	Planned
	Norway 30.6		NA	NA
Norske Shell				
Four Units	**Jacket (Qtrs) (----)**	NA	NA	Under study
	Troll field	NA	900	92
	Norway 31.2, 3, 5, 6			
	Jacket (piled steel) (---) (concrete) or T-300	Condeep		
Norwegian Contractors				
Gullfaks	NA (----)	Statoil	52 NA	
	Vats, Norway	716		May 89
Sleipner	NA (----)	Statoil	NA	Construction
	Stavanger, Norway	346	Jul. 89	
Troll	NA (----)	Norske Shell	NA	Under study
	NA	NA	NA	
Draugen	NA (----)	Norske Shell	NA	Under study
	NA	NA	NA	
Occidental Int. Oil				
	NA (----)	NA	NA	Under study
	Piper field	474	NA	
	NA (----)	NA	NA	Under study
	Chanter field	470	NA	
Wintershall Noordzee				
K10-V	Unknown (----)	NA	NA	Under study
	NA	1021	991-92	
Petroland				
L7N	Jacket (satellite) (----)	Hecrema Haven	NA	Construction
	Netherlands, bedrijf B.V.	NA		Autumn 88
Phillips				
	Jacket (----)	NA	NA	Under study
	Toni-Thelma field, UK 16.17	Tiffany	430	NA
Shell Expro (Shell Esso)				
Tern	Jacket (----)	RGC	30	Design
	UK Tern field	Methil	550	89
Kittiwake	Jacket (----)	NA	16	Under study
	UK Kittiwake field		279	91
Draugen	Jacket (Qtrs) (----)	Not awarded	12	Under study
	Draugen field (Nor)	Concrete	853	91
Statoil				
Gullfaks C	Jacket (Qtrs) (----)	Norwegian Cont.	52	Construction
	Norway 34.10	Stavanger	716	May 89
Veslefrikk	Jacket (4---)	NA	20	Engineering
	Veslefrikk field		566	Spring 89
Sleipner A	Jacket (integrated) (----)	NA	NA	Planned
	Sleipner field		346	Summer 92
Zeepipe Riser	Riser on Pipeline	NA	NA	Planned
	NA		NA	92-93
CANADA (1)				
Mobil				
Hibernia	Jacket (----)	Unknown, Argentia	NA	Design
	Off East Coast	and Adam's	NA	91

Operator Platform name	Fabrication yard Location	Type or Function (No. legs main piles skirt piles)	Water Depth No. Well Slots	Install. Date
SOUTHEAST ASIA/OCEANIA (46)				
BHP Petroleum				
Challis	Jacket (ffoater) (----)	NA	NA	Under study
	Timor Sea		360	NA
Bohai Bay Oil				
	Jacket (----)	NA	0	Planned
	Bohai Bay, China		81	NA
Bond				
	Jacket (satellite) (----)	NA	NA	Planned
	Heera field, Australia	NA	NA	
Brunei Shell Petroleum				
FADP-7	Jacket (4.4.-)	NA	4	Design
Fairley field		200	May 90	
CPWJ-AX	Jacket (4.4.-)	NA	4	Planned
	Champion field	130	Jun. 91	
CPWJ-AC	Jacket (4.4.-)	NA	4	Planned
	Champion field	110	Jan. 92	
CPDP-AU	Jacket (6.6.-)	NA	12	Planned
	Champion field	105	Oct. 91	
CPDP-AS	Jacket (6.6.-)	NA	12	Planned
	Champion field	85	Oct. 93	
Carigali Petronas				
Dulang A	Jacket (4---)	NA	24	Design
	South China Sea, West Malaysi	249	NA	
Dulang B	Jacket (8---)	NA	24	Design
	South China Sea		249	NA
Dulang C	Jacket (4---)	NA	24	Design
	South China Sea		249	NA
Dulang D	Jacket (4---)	NA	28	Design
	South China Sea		249	NA
Bayan DP-B	Jacket (----)	Sime Sembawang	15	Fabrication
	South China Sea	104	Dec. 88	
Bokor-A	Jacket (gas compression) (----)	A.Y. Engineering		Fabrication
	South China Sea	220	May 89	
D-35	NA (----)	NA	NA	Design
	South China Sea	NA	NA	
St. Joseph JT-B	Jacket (----)	Sime Sembawang	9	Fabrication
	South China Sea	113	Dec. 88	
St. Joseph JT-B	Jacket (----)	NA	9	Design
	South China Sea	92	NA	
St. Joseph JT-C	Jacket (----)	NA	7	Design
	South China Sea	128	Design	
Erb West DP-B	Jacket (----)	Bina	15	Fabrication
	South China Sea	210	Dec. 88	
St. Joseph G-A	Jacket (gas injection)	NA	NA	Design
	NA	NA	NA	
Seligi-G	Jacket (----)	NA	NA	Design
	South China Sea	NA	NA	
Chengbai Oil				
BZ-32	Jacket (4---)	Nippon Steel	24	Planned
	Bohai Gulf, China	Japan	67	NA
Esso Australia				
Seahorse, Whiptail, Whiting, Dolphin, Perch, Tarwhine	Jacket (----)	NA	NA	Under study
	Gippsland basin, Victoria	130-175	NA	
Hudbay				
	Two Wellhead (----)	NA	NA	Planned
	Mengkapan field, Indonesia	NA	NA	
Japan National Oil				
	Iwafune-oki	Jacket (8---)	NA	20 Planned
	Sea of Japan	115	NA	
	Jacket (gravity caisson) (----)	NA		Under study
	Chaivo field, U.S.S.R.	66-98	NA	
	Jacket (gravity caisson) (----)	NA		Under study
	Odopt field, U.S.S.R.	98	NA	
BZ-28-1	Jacket (floating) (----)	China		Construction
	Bohai Gulf, China	6588		

Offshore production systems planned, installed in '88 — continued

Operator Platform name	Fabrication yard Location	Type or Function (No. legs main piles skirt piles)	Water Depth	No. Well Slots	Install. Date
BZ34-2/4E Construction	Jacket (floating) (-/-/-) Bohai Gulf, China	65		China 89	
Lufeng 13-1	Jacket (floating) (-/-/-) S. China Sea	NA 460		- NA	Under study
Japex Offshore					
JCODC (Japan China Oil Development Co.)					
BZ28-1	Jacket (satellite) (-/-/-) Bohai Gulf off China	NA		NA NANA	Engineering
BZ28-1	Jacket (floating) (-/-/-) Bohai Gulf off China	NA		NA 6588	Planned
BZ34-2/4	Jacket (floating) (-/-/-) Bohai Gulf off China	NA	NA	65	Under study 88
Marathon Petroleum					
Talisman	Jacket (floating) (-/-/-) NW shelf, W. Aust.	NA NA		NA NA	Under study NA
Nippon Steel					
P6A	Jacket (4/4/0) Amara yard, Thailand		240	12 Apr. 89	Under construction
P6B	Jacket (4/4/0) Amara yard, Thailand		240	12 Apr. 89	Under construction
P7A	Jacket (4/4/0) Amara yard, Thailand		240	12 Oct. 89	Under construction
P7B	Jacket (4/4/0) Amara yard, Thailand		240	12 Oct. 89	Under construction
Phillips					
	Jacket (8/8/0) Xijiang 24/3, South China Sea	NA		24 320	Design 1990
POC	Jacket (-/-/-) 3DA structure, Gulf	NA		8 NA	Planned NA
SSB/Petronas					
TEJT-T	Jacket Promet (-/-/-) S. China Sea	Deck, Sabah yard	NA	90	Fabrication Nov. 88
Sakhalin Oil Development					
	Jacket (4/-/-) Odoptu field	NA	100	40-60	Planning Middle 90s
	NA (-/-/-) Chaivo field	NA	80	40-56	Planning Middle 90s
Shell/BP/Todd					
	Jacket (4/20/-) Maui field, New Zealand	NA	39692	10	Design
Total Chine					
	Jacket (-/-/-) Weizhou field, Japan	Nippon Steel	NA	NA	Fabrication NA
Unocal Thailand					
PWF	Wellhead (4/-/-) Gulf of Siam	Wakamatu Kita-Kyushu		12 213	Construction NA
PWG	Wellhead (4/-/-) Gulf of Siam	Wakamatu Kita-Kyushu		12 213	Construction NA
PWH	Wellhead (4/-/-) Gulf of Siam	Wakamatu Kita-Kyushu		12 213	Construction NA
Vietsovpetro					
	Jacket (-/-/-) White Tiger field	Baku, USSR		16 NA	Fabrication NA
	Jacket (serv. supply) (-/-/-) White Tiger field	NA		NA NA	Planned NA
Western Australia Petroleum					
Saladin	Jacket (-/-/-) Western Australia	NA		NA NA	Under study NA
Western Mining Corp.					
North Herald	Jacket (-/1/-) Perth, Australia	McDermott	NA	56 NA	Under study
Woodside Offshore					
Goodwyn	NA NW shelf Australia	NA	420	24	Under study 91

Operator Platform name	Fabrication yard Location	Type or Function (No. legs main piles skirt piles)	Water Depth	No. Well Slots	Install. Date
LATIN AMERICA/CARIBBEAN (33)					
ENAP					
SK-4	Jacket (4/-/-) PTA, Arenas	Laredo	112	9 Feb. 89	Planned
AN-1	Jacket (4/-/-) PTA, Arenas 197	Laredo		18 197	Planned Nov. 88
CAN-1	Jacket (4/-/-) *PTA, Arenas 27	Laredo		12	Planned Sept. 89
CAN-2	Jacket (4/-/-) PTA, Arenas	Laredo	27	9 Oct. 89	Planned
Enap-Magallanes					
Skua 3	Jacket (4/4/-) NA	Bahia Laredo	120	9 NA	Planned
Skua 4	Jacket (4/4/-) NA	Bahia Laredo	114	9 NA	Planned
Anguila 1	Jacket (4/4/-) NA	Bahia Laredo NA		12 200	Planned NA
Petrobras					
Pargo-1A	Jacket (utilities) (4/4/8)	NA		21	Construction
Brazil		331	Dec. 88		
Pargo-1B	Jacket (Utilities) (4/4/8)	NA	NA		Construction
Brazil		331	Dec. 88		
Carapeba-1	Jacket (4/4/8)	NA		15	Construction
Brazil		283	Dec. 88		
Carapeba-2	Jacket (4/4/8)	NA		21	Construction
Brazil		286	Dec. 88		
Vermelho-1	Jacket (4/4/8)	NA		21	Construction
Brazil		262	Mar. 89		
Vermelho-2	Jacket (4/4/8)	NA		21	Construction
Brazil		262	Jan. 89		
Vermelho-3	Jacket (4/4/8)	NA		21	Construction
Brazil		267	Mar. 89		
Atum-3	Jacket (4/4/8)	NA		12	Construction
Brazil		137	Jan. 89		
Carapeba-3	Jackup (-/-/-)	NA		18	Under study
Brazil		300	Jun. 91		
Enchova-Oeste	Jacket (8/-/32)	NA		27	Under study
Brazil		387	May 92		
Enchova	Jacket (-/-/-)	NA		18	Under study
Brazil		394	Jan. 92		
Pescada-1	Jacket (Utilities) (4/4/8)	NA	NA		Under study
Brazil		70	Jan. 92		
Pescada-2,3, 4 and 5	Jacket (4/4/8) Brazil	NA	24 70	Jan. 92	Under study
Marlim	Semi (-/-/-)	NA	NA	10	Under study
Brazil		1,970	Jan. 91		
Marimba	Semi (-/-/-)	NA		10	Under study
Brazil		1,500	Jan. 91		
Merluza	Jacket (4/4/8)	NA		6	Construction
Brazil		557	Jan. 92		
Tubarao	Semi	NA	NA		Planned
Brazil		560	Jan. 92		
Albacora	Semi	NA	NA	18	Planned
Brazil		1,000	Jun. 92		
Camorim-10	Jacket (4/4/4)	NA		6	Construction
Brazil		68	Apr. 89		
Enchova-Oeste	Jacket (8/8/12)	NA		27	Under study
Brazil		387	Jun. 90		
Camorim-11	Jacket (4/4/4)		6		Under study
Brazil		85	May 89		
Camorim-12	Jacket (4/4/4)		6		Planned
Brazil		85	NA		
Pescada-1	Jacket (8/8/-)	NA	NA		Planned NA
Brazil		70	NA		
Pescada 2,3,4 5 and 6	Jacket (4/4/-) Brazil	NA	50-80	NA 4	Planned
Petrobras XVIII	Semi GVA 4500 (-/-/-)	NA		NA	Under study
Brazil		5,250	Feb. 92		
Petrobras XIX	Semi GVA 4500 (-/-/-)	NA	NA		Under study
Brazil		5,250	Jan. 92		
TLP conceptual	Jacket (tension-leg) (-/-/-)	NA		19	Planned
NA project	Brazil		3,280	NA	
Merluza	Jacket (4/-/8)	NA		7	Under construction
Brazil	360		Jul. 89		

Offshore production systems planned, installed in '88 — continued

Operator Platform name	Fabrication yard Location	Type or Function (No. legs/main piles/skirt piles)	Water Depth/No. Well Slots	Install. Date
Carapeba-3	Jacket (4/-/4)	NA	18	Planned
Brazil		285/NA		
Shell				
	Jacket (-/-/-)	NA	10-11/	Planned
	Strait of Magellan		230	NA
Total				
	Jacket (-/-/-)	NA	9/	Planned
	Hidra field Argentina		90	NA
Total Australia				
Hidra North	Jacket (4/-/-)	NA	12/	Call for bid
	Tierra del Fuego	NA	75	End 88
Hidra Centre	Jacket (4/-/-)	NA	12/	Call for bids
	Argentina	NA	105	End 88
MIDDLE EAST (16)				
Total CFP (Amapetco)				
Shukheir Marine	Jacket (4/-/-)	NA	3/	Planned
	Egypt	100/Mid 89		
Hidra Center	Jacket (water injec.) (4/-/-)	NA	12/	Construction
	Buenos Aires	110/Feb. 89		
Hidra North	Jacket (water injec.) (4/-/-)	NA	12/	Construction
	Buenos Aires	85/Feb. 89		
ARA	Jacket (6/-/-)	NA	12/	Under study
	NA	50/Mid 90		
North Aegean Petroleum				
	Jacket (-/-/4)	NA	12/	Under study
	NA	120/90		
	Jacket (-/-/4)	NA	NA	Under study
	NA	NA	NA	
Mavanga A	Jacket (4/-/-)	NA	12/	Design
	Angola	110/Aug. 90		
Mavanga B	Well Protector (4/-/-)	NA	6/	Design
	Angola	110/Aug 90		
Wepco				
P3	Jacket (4/-/-)	NA	2/	Design
	Abu Qir Bay		59	Sept. 89
NAF-I	Jacket (-/-/-)	NA	NA	Planned
	Abu Qir Bay	115/Nov. 90		
Udeco				
	NA	NPCC	NA	NA
	Satah Bridge	Sadiyat	NA	NA
	NA (4)	NPCC	NA	NA
	Satah	Sadiyat	NA	NA
PMP	Jacket (6/-/-)	NPCC	NA	NA
	Satah	Sadiyat	NA	NA
2FP	Jacket (4/-/-)	NPCC	NA	NA
	Satah	Sadiyat	NA	NA
2FP	TPWER	NPCC	NA	NA
	Satah	Sadiyat	NA	NA
WHP1	Jacket (4/-/-)	NPCC	6	NA
	Satah	Sadiyat	45	NA
WHP2	Jacket (4/-/-)	NPCC	9	NA
	Satah	Sadiyat	36	NA
WHP3	Jacket (4/-/-)	NPCC	6	NA
	Satah	Sadiyat	48	NA
WHP4	Jacket (water injec.) (4/-/-)	NPCC	6	NA
	Satah	Sadiyat	31	NA
WHP5	Jacket (water injec.) (4/-/-)	NPCC	6	NA
	Satah	Sadiyat	39	NA
WHP6	Jacket (4/-/-)	NPCC	9	NA
	Satah	Sadiyat	14	NA
WHP7	Jacket (water injec.) (4/-/-)	NPCC	6	NA
	Satah	Sadiyat	44	NA
WHP8	Jacket (4/-/-)	NPCC	9	NA
	Satah	Sadiyat	46	NA
WHP9	Jacket (gas lift/ injec.) (4/-/-)	NPCC	6/NA	
	Satah	Sadiyat	45	NA
PMP	Jacket (6/-/-)	NPCC	NA	NA
	Satah	Sadiyat	44	NA

Operator Platform name	Fabrication yard Location	Type or Function (No. legs/main piles/skirt piles)	Water Depth/No. Well Slots	Install. Date
WEST AFRICA (22)				
AGIP-Recherches				
DP-6	Jacket (4/-/-)	NA	12/	Under definition
	Loango field	NA	NA	Mid 89
Chevron Overseas Pet.				
Elf-Congo TAP	Jacket (4/-/-)	NA	NA	Planned
	Tchibouela		280	Autumn 88
Elf Angola				
BUF F1	Jacket (4/-/-)	Ambrise	16/	Construction
	Bufalo field		280	Spring 88
IPS F1	Jacket (4/-/-)	NA	16/	Planned
	Impala Sud Est		195	89
PAC F3	Jacket (4/-/-)	NA	8/	Under study
	Pacassa field		280	89
Chevron Overseas Pet.				
Numbi A	Jackets (4/4/-)	Petromar	9/	Construction
	Numbi field, Angola		135/Dec. 88	
Numbi E	Jacket (4/4/-)	Petromar	9/	Pending
	Numbi field, Angola		130/89	
Numbi F & G	Jacket (4/-/-)	NA	9/	Design
	Numbi field, Angola		140/Dec. 88	
ALP-AUX	Jacket (gas sweet.) (4/4/-)	NA	-/	Under study
	NA		185/90	
GS-N	Jacket (8/-/-)	Petromar	-/	Construction
	Numbi field, Angola		140/Jul. 90	
	Well Jackets (4)	NA	9	Awaiting design
	Numbi field, Angola		140	Dec. 89
Alp	Jacket (8/8/-)	McDermott	-/	Construction
	Takula field, Angola		185	Dec. 88
Takula Alp	Jacket (gas comp.) (8/-/-)	Petromar	-	Construction
	Takula field, Angola		185/Apr. 89	
GS-P	Jacket (8/-/-)	Sharjah, UAE	-/	Construction
	Wamba field, Angola		210/Apr. 90	
Wamba B	Jacket (4/-/-)	Petromar	9	Construction
	Wamba field, Angola		210	Jan. 89
Takula Wip	Jacket (8/8/-)	Petromar	-/	Construction
	Takula field, Angola		185/Jun. 90	
Takula Tap	Jacket (8/-/-)	Petromar	-/	Design
	Takula field, Angola		185/Mar. 90	
	Jacket (module) (8/8/-)	NA	-/	Design
	Takula field, Angola	NA	90	
IMP F1	Jacket (4/-/-)	NA	16/	Being designed
	Impala field, Angola		216	Jun. 89
Pac F3	Jacket (4/-/-)	NA	18/	Being designed
	Pacassa field, Angola		286	Mar. 89
Motoba 5 Negotiating	Jacket (3/3/0)	NA	3/	
	Motoba field, Zaire		3589	
Motoba 6	Jacket (3/3/0)	NA	3/	Negotiating
	Motoba field, Zaire		3589	
Motoba 7	Jacket (3/3/0)	NA	3/	Negotiating
	Motoba field, Zaire		3589	
Motoba Flow Sta	Jacket (gathering sta.) (4/4/0)		0/	Planned
	Motoba field, Zaire		35/NA	
Libwa Flow Sta.	Jacket (gathering sta.) (4/4/0)		0/	Planned
	Libwa field, Zaire		20/NA	
Texaco				
Mavanga A	Jacket (4/-/-)	NA	12/	Design
	Angola		124/Oct. 90	
Mavanga B	Jacket (4/-/-)	NA	6/	Design
	Angola		118/Oct. 90	
Chuchupa B	Jacket (4/-/-)	NA	-/	Design
NA		115/Jun. 90		
	Jacket (4/-/-)	NA	12/	Design
NA		115/Jun. 90		

Source: Annual production system survey by Offshore, Incorporating The Oilman.

Gas production (billions cu ft)

	1988
WESTERN HEMISPHERE	
Argentina	757.4
Barbados	0.7
Bolivia	106.5
Brazil	193.7
Canada	3,990.2
Chile	56.3
Colombia	173.5
Ecuador	3.6
Guatemala	0.3
Mexico	1,308.5
Peru	46.1
Trinidad	156.3
United States	17,504.0
Venezuela	722.9
Total	**25,020.0**
EUROPE	
Austria	44.4
Denmark	84.6
France	113.2
Germany, Fed. Rep.	551.7
Greece	3.0
Italy	703.7
Netherlands	2,412.8
Norway	1,002.9
Spain	33.4
Turkey	3.5
United Kingdom	1,640.5
Total	**6,593.7**
MIDDLE EAST	
Bahrain	184.9
Iran	620.0
Iraq	110.4
Israel	1.5
Kuwait	174.6
Oman	73.2
Qatar	204.2
Saudi Arabia	899.3
Syria	22.2
United Arab Emirates	600.0
Total	**2,890.3**
ASIA-PACIFIC	
Afghanistan	101.4
Australia	544.4
Bangladesh	152.9
Brunei	306.1
Burma	32.0
India	312.3
Indonesia	1,223.7
Japan	71.5
Malaysia	464.8
New Zealand	189.0
Pakistan	441.7
Taiwan, China	37.9
Thailand	194.8
Total	**4,072.5**
AFRICA	
Algeria	1,542.4
Angola	7.8
Egypt	197.3
Gabon	2.4
Libya	198.0
Morocco	2.3
Nigeria	126.0
Tunisia	13.1
Total	**2,089.3**
COMMUNIST	
China	715.3
Romania	1,318.8
USSR	27,192.3
Other	1,087.3
Total	**30,313.7**
WORLD TOTAL	**70,979.5**

World well completions—1987*

	Total wells	Total wildcats	Total producers	Total wildcat producers
United States	35,917	7,003	23,457	1,583
Canada	7,078	2,369	5,293	1,318
Australia	282	167		
Africa, Central South				
Angola	66	24		10
Burundi	2	2		0
Cameroon	6	0		0
Congo	35	10		4
Gabon	31	16		9
Ghana	11	11		0
Malagasy Rep.	2	2		1
Kenya	2	2		0
Namibia	1	1		0
Nigeria	72	44		23
Somali Rep.	1	1		0
South Africa	17	17		2
Tanzania	2	2		0
Zaire	4	1		0
Zambia	2	2		0
Europe				
Austria	34	24	21	11
Denmark	1	1	12	0
W. Germany	38	24	7	7
France	93	38	60	14
Greece	3	3	0	0
Ireland	4	4	1	1
Italy	181	96	99	34
Netherlands	33	11	24	2
North Sea				
U.K.	240	111	145	42
Danish	7	6	3	2
Dutch	34	24	22	12
Norwegian	69	33	51	21
Spain	13	12	3	2
Sweden	8	6	4	2
Switzerland	1	1	0	0
U.S.S.R.	33	31	9	8
Yugoslavia	128	3		2
Far East				
Bangladesh	2	2		
Brunei	20	12		
Burma	103	3		
India	316	37		
Indonesia	586	75		
Japan	13	12		
Malaysia	80	13		
Pakistan	39	9		
People's Rep. of China	5,721	21		
Philippines	3	2		
Rep. of China	11	9		
Thailand	51	23		
Israel	4	2	2	0
Bahrain	24	0	24	0
Iraq	89	10		
Kuwait	23	2		
Oman		36		21
Syria		10		8
Turkey		31		2
New Zealand	23		7	
North Africa				
Algeria	45	25		1
Egypt	130	55		21
Libya	41	25	20	10
Morocco	7	7		1
Sudan	1	1		0
Tunisia	25	16	16	3
Latin America				
Argentina	416	45		10
Bolivia	25	10	16	2
Brazil	950	176	704	57
Chile	104	35	59	9
Colombia	162	69	108	27
Costa Rica	3	3	0	0
Ecuador	30	9	23	3
Guatemala	1	0	1	0
Mexico	103	27	68	8
Paraguay	2	2	0	0
Peru	152	13	138	8
Suriname	35	9	23	3
Trinidad-Tobago	142	8	79	4
Uruguay	1	1	1	1
Venezuela	177	21		

*AAPG data

Coal seam methane tax credit

Year of Production	Inflation adjustment factor	GNP deflator	Oil price, $/bbl	Tax credit $/MMBTU	Oil price required for phaseout Partial	Total	
1979	1.0000	1.0000	—	—	23.50	29.50	
1980	1.0896	1.0896	33.03	0.0000	25.61	32.14	Actual
1981	1.1900	1.0921	32.19	0.2513	27.97	35.10	
1982	1.2676	1.0652	28.50	0.6556	29.79	37.39	
1983	1.3197	1.0411	26.19	0.6826	31.01	38.93	
1984	1.3673	1.0361	25.88	0.7072	32.13	40.34	
1985	1.4211	1.0393	24.08	0.7351	33.40	41.92	
1986	1.4555	1.0242	12.66	0.7528	34.20	42.94	
1987	1.4949	1.0271	15.41	0.7732	35.13	44.10	
1988	1.57	1.041	—	0.81	36.89	46.31	Projected
1989	1.66	1.056	—	0.86	39.01	48.97	
1990	1.75	1.057	—	0.91	41.12	51.62	
1991	1.82	1.040	—	0.94	42.77	53.69	
1992	1.89	1.040	—	0.98	44.48	55.84	
1993	1.97	1.040	—	1.02	46.26	58.07	
2000	**2.59**	**1.040**	**—**	**1.34**	**60.90**	**76.43**	

Source: Northwest Fuel Development Inc.

been open hole completions, said William F. Clark, petroleum engineer, Blackwood and Nichols Co. Ltd., Durango, and Tom Hemler, geologist, Carbon River Energy, Seattle.

The operator usually cements 7 in. casing above the Fruitland and drills out using a fluid.

When 100-300 ft of uncased wellbore is open to several coal zones, a liner is usually used. Slotted liners and gravel pack completions have been tried with mixed results. Both have plugging problems.

Most Fruitland wells require artificial lift. Sucker rod pumps are the most common.

Determining which pool a well's hydrocarbons are coming from can be a problem in some areas because of the intertonguing of the Fruitland formation and the Pictured Cliffs sandstone, Clark and Hemler said.

Horizontal drainholes have been successfully placed into Rocky Mountain coal seams using short and medium radius directional drilling techniques, says Terry L. Logan, manager of operations, Resource Enterprises Inc., Grand Junction, Colo.

The cost to place a horizontal drainhole using either technique is about $17,600/day.

Success of horizontal drainhole drilling projects required a team approach with fully integrated expertise in well design, field supervision, drilling, cementing, and well site geology, Logan said.

Coalbed reservoirs produce a distinctive bicarbonate type connate water and have higher reservoir pressures than adjacent sandstones, say Dudley D. Rice and three other USGS authors.

Also, coal generated gas is usually contained in the coal beds, neither expelled nor migrated into adjacent sandstone reservoirs.

These factors and differences in composition of the gas indicate that coal beds are a closed reservoir system created by the gas, water, and associated pressures being trapped in the micropore structure, Rice said.

Federal tax credit boosts Fruitland drilling

A bill passed in the closing days of the 1988 congress extended to the end of 1990 from the end of 1989 the drilling time to take advantage of the unconventional energy tax credit.

The credit was part of the Crude Oil Windfall Profits Tax of 1980. WPT was repealed in summer 1988, but the tax credit continues because it was in a part of the Internal Revenue Code not repealed.

The credit should be 78¢/MMBTU in 1987 and rise to 91¢ in 1990 and $1.34 in 2000, according to one estimate.

Tax credit phaseout, possible if crude oil prices rise too much, has not been a factor since 1981 and is not expected to play a role for at least several years, if ever. For instance, the price of oil would have to exceed $35.40/bbl in 1987 before the phaseout factor lowered the credit from 78¢.

The credit is applicable only for production from new wells on new property as defined by the Tax Reform Act of 1986.

The credit may not apply if the gas is sold at incentive prices allowed under Natural Gas Policy Act Sec. 107. This has been an academic consideration for several years.

Several IRS letter rulings conclude that producers can switch back and forth between accepting incentive prices and the tax credit but not double dip.

The wells cannot be drilled into reservoirs where commercial gas was produced from coal seams prior to 1980. Production from valid wells is eligible for the tax credit until Jan. 1, 2001.

The credit has to be taken in the year the gas is produced and, once taken, is not subject to recapture like investment tax credits.

If the owner of coalbed methane production does not have a current tax liability against which the credit can be taken, there are ways of reorganizing projects where the credit could be taken, says Peet Soot, Northwest Fuel Development Inc., Portland, Ore.

The credit's benefits are apportioned among owners of the production according to their respective interests in gross sales.

Fruitland, San Juan basin geology notes

Diameter of the San Juan basin is about 100 miles, and surface area is about 7,500 sq miles, says James E. Fassett, U.S. Geological Survey, Lakewood, Colo.

In the conterminous U.S., the San Juan basin gas field is second in size only to Hugoton field of Oklahoma, Kansas, and Texas.

Cumulative basin production through 1982 was 190 million bbl of oil, 14 tcf of nonassociated gas, 425 bcf of associated gas, and 60 million bbl of condensate.

Only about 90 bcf of gas has come from the Fruitland, and about half that came from Ignacio Blanco field.

Two authors suggest that most of the basin's gas is coalbed methane that migrated into sandstones. Various

Of total EOR U.S. production in 1988, thermal output accounted for 72.9% compared to 79.3% in 1986; chemical output was 3.5% compared to 2.8% in 1986; and gas production was 23.6 vs. 17.9%

The most barrels of EOR production lost was in the steam category and most of that was in venerable California fields. Table H shows steam and other type projects terminated or completed since the 1986 survey. California steam projects were obviously pummeled by low crude prices.

One small California producer with a 160-acre project started in 1965 was employing 34 producers and 20 injector wells to make 140 b/d of 13° API oil.

He shut down the project in 1986 because he needed $14/bbl to stay in operation but was only getting $9/bbl.

A production manager working for a larger company in Kern County, Calif., reported earlier this year that he had turned off the steam, his reservoir had cooled down, and he was "just pumping the dregs" trying to keep the office open a bit longer. This operation was getting $12 to $13/bbl for crude of 13 to 16° API gravity oil. However, this manager reported that in December 1987 his lease costs were running $21/bbl. That is how much he would need per barrel to break even.

But steam EOR is also characterized by huge projects. The largest of all steam projects is Shell Oil's Belridge project in California making 101,000 bo/d. Second largest is

Table A

U.S. planned EOR projects by type

Operator	Project type	Field	State	Size, acres	Pay zone	Depth, ft	Gravity, °API	Target date
Mobil*	Alkaline	Luling	Tex.	200	Edwards Limestone	2,100	28.0	6/89
Nat. Coop. Refinery Assn.*	Alkaline-polymer	W. Moorcroft	Wyo.	640	Muddy S5	3,600	32.0	5/88
Mobil	CO_2	Postle	Okla.	23,000	Morrow	6,200	40.0	1991
Mobil*	CO_2	Shiloh	Tex.	3,900	Upper Pettit	7,100	38.0	12/89
Amoco*	CO_2 miscible	Lost Soldier	Wyo.	1,400	Tensleep	5,000	35.0	1988
Amoco*	CO_2 miscible	Anton Irish	Tex.	8,545	Clearfork	5,900	28.0	1989
Amoco	CO_2 miscible	Slaughter	Tex.		San Andres	4,950	27.0	
Chevron*	CO_2 miscible	North Ward Estes	Tex.	3,840	Permian Yates	2,900	37.0	4/89
Conoco	CO_2 miscible	E. Huntley	Tex.	1,308	San Andres	3,180	36.0	1989
Conoco	CO_2 miscible	W. Sussex	Wyo.	1,740	Shannon	3,040	38.0	1991
Conoco	CO_2 miscible	North El Mar	N.M.	2,000	Delaware	4,600	41.0	1989
Conoco	CO_2 miscible	McCallum	Colo.	813	Pierre 'B'	800	28.0	Late 1988
Conoco	CO_2 miscible	Maljamar	N.M.	3,840	Grayburg-San Andres	3,665	38.0	1/88
Mobil*	CO_2 miscible	Slaughter	Tex.	2,495	San Andres	4,900	32.0	7/89
Texaco*	CO_2 miscible	Wasson	Tex.	13,655	San Andres	5,100	33.0	6/89
Texaco*	CO_2 miscible	Paradis	La.	44	9500-Foot	9,800	38.0	3/88
Texaco*	CO_2 miscible	Paradis	La.	160	16 Sand	9,900	38.0	7/88
ARCO Alaska*	HC immiscible	Kuparuk River	Alaska	7,680	Kuparuk A & C	6,000	24.0	3/88
ARCO Alaska*	HC miscible	Prudhoe Bay	Alaska	4,000	Sadlerochit	8,800	27.0	9/88
ARCO Alaska*	HC miscible	Prudhoe Bay	Alaska	5,000	Sadlerochit	8,800	27.0	9/89
ARCO Alaska*	HC miscible	Kuparuk	Alaska	5,120	Kuparuk	6,000	23.0	6/88
Kerr-McGee*	HC miscible	North Buck Draw	Wyo.	4,800	Dakota	12,500	45.0	10/88
Louisiana Land & Expl.*	HC miscible	Buck Draw	Wyo.	4,800	Dakota	12,500	46.0	1/89
Texaco	Hot water	San Ardo	Calif.	130	Aurignac	2,200	13.0	7/89
ARCO	Polymer	Dundee Healdton Unit	Okla.	660	Penn	1,000	31.0	1988
Citronelle Unit*	Polymer	Citronelle	Ala.	160	Rodessa	10,600	42-45.0	Open
Enron Oil & Gas*	Polymer	Big Piney	Wyo.	2,789	Mesaverde	3,500	44.0	7/87
Mitchell Energy*	Polymer	Alba	Tex.	512	Sub-Clarksville	4,010	45.5	7/87
Sun E&P*	Polymer*	Dora Roberts	Tex.	150-700	San Andres	2,100	29.0	3/88
Sun E&P*	Polymer*	Stephens County Regular	Tex.	1,000	Caddo	3,200	39.0	4/88
Texaco*	Polymer	Inglewood	Calif.	20	VMR	2,800	18.0	7/89
Unocal*	Polymer	Hueneme	Calif.	135	Hueneme	5,400	14.0	1/89
Chevron*	Steam	Midway Sunset	Calif.	22	Sub Lakeview	1,000	11.0	1989
Chevron*	Steam	Coalinga	Calif.	150	Temblor	950	13.0	1989
Chevron	Steam	Coalinga Sec. 31A	Calif.	100	Temblor	900	14.0	1/87
Chevron*	Steam	Whittier	Calif.	10	1st Zone	1,000	15.0	1988
Chevron*	Steam	Homer	La.	40	Nacotoch	1,250	37.0	4/89
Chevron*	Steam	Coalinga	Calif.	100	Temblor	900	14.0	1988
DCR Petroleum*	Steam	Camp Hill	Tex.	35	Carrizo	400	18.4	7/88
DCR Petroleum*	Steam	O'Connell	N.M.	1.2	O'Connell	350	17.0	5/88
DCR Petroleum*	Steam	T-4	N.M.	1.2	O'Connell	700	17.0	5/88
Lawrence-Allison*	Steam	Teapot Dome NPR-3	Wyo.	60	Shannon	300	33.0	10/88
M.H. Whittier*	Steam	Coalinga	Calif.	25	Temblor	1,500	14.0	1/89
MacPherson Oil*	Steam	Mt. Poso	Calif.	243	Bedder	2,200	16.0	1989
Mobil	Steam	Midway Sunset	Calif.	20	Monarch	950	13.0	1988
Mobil*	Steam	North Midway Sunset	Calif.	300	Potter	1,200	12.0	1/99
Mobil*	Steam	Talco	Tex.	5	Paluxy	4,300	19.0	6/88
Mobil	Steam	West Newport	Calif.	12	A Zone	600-1,450	13.0	1/88
Mobil*	Steam	Bayou Bleu	La.	22	Sch. No. 1 RD	1,500	18.0	12/89
Mobil*	Steam	Bayou Bleu	La.	140	Sch. No. 1 RA	1,700	18.0	2/88
Oxy USA	Steam	South Kern Front	Calif.	80	Etchegoin chanac	1,500	14.0	1/90
Oxy USA	Steam	North Kern Front	Calif.	342	Etchegoin	1,300-1,500	14.0	1/89
Tenneco*	Steam	Midway-Sunset	Calif.	15	Metson	1,400	12.0	1988
Tenneco*	Steam	Placerita	Calif.	55	L. Kraft	1,800	12.0	1988
Tenneco*	Steam	Kern River	Calif.	24	Kern River	600	13.5	1988
Texaco*	Steam	San Ardo	Calif.		Lombard	1,900	11.0	
Texaco*	Steam	Kern River	Calif.	111	Kern River Series	1,000	13.0	9/88
Texaco*	Steam	Cat Canyon	Calif.	800	S1B	2,500	10.0	4/88
Texaco*	Steam	Midway	Calif.	12	Potter	1,000	13.0	1/89
Texaco*	Steam	Poso Creek	Calif.	55	Basal Etchegoin	2,400	12.3	2/88
Texaco*	Steam	McKittrick	Calif.	12	Potter	1,100	13.0	1/89
Texaco*	Steam	Cat Canyon	Calif.	460	S2-S8	2,600	10.0	4/88
Texaco*	Steam	Sour Lake	Tex.	5	Miocene	1,400	18.0	1/88
Texaco*	Steam	Midway	Calif.	5	Potter	950	12.0	7/88
Union Pacific Resources*	Steam	Wilmington	Calif.	95	Tar	2,500	14.0	1/89
Unocal*	Steam	Cymric (Walport)	Calif.	80	Tulare	1,200	13.0	1989
Unocal	Steam	Cymric	Calif.	150	Antelope Shale	2,400	13.0	1989
Unocal*	Steam	Midway Sunset	Calif.	16	Hoyt	1,750	13.0	6/88
Unocal*	Steam	S. Tapo Canyon	Calif.	15	4th Sespe	2,100	16.0	3/88
Unocal	Steam	Brea	Calif.	150	Pliocene	2,500	16.0	1990

*Project for which investment data were available.

Texaco's Kern River project with 87,600 bo/d. These two projects account for 41% of the steam enhanced production in the U.S.

Steam EOR is also a key element in what is perhaps a unique EOR project. A $125 million, 49.5 × 10^6 w coal- fired cogeneration plant is under construction on a 5-acre site about 12 miles north of Bakersfield, Calif. The coal will come by train from Utah. The steam produced will be used for generating electricity and for injection in leases that Macpherson Oil Co. operates in the nearby Mt. Poso field. Macpherson is also co-owner of the cogeneration facility.

The company says that primary recovery from the Mt. Poso field, west area, is now 30% of the original oil in place and that the thermal operations will increase total expected recovery to in excess of 60%.

Guide to EOR project tabulations

Table A: U.S. planned EOR projects by type
Table B: Planned projects outside U.S. by country
Table C: Producing Canadian EOR projects
Table D: Producing EOR projects outside U.S. and Canada
Table E: Producing thermal-EOR projects in U.S.
Table F: Producing CO_2 gas-EOR projects in U.S.
Table G: Producing chemical-EOR projects in U.S.
Table H: Completed, terminated U.S. projects

Polymer projects

Although there was a major drop in polymer projects during the period 1986-1988, there was a healthy gain in output (Table 1 and Table G).

The reasons are that of the some 80 polymer projects shut down since 1986 over half of them had not previously reported any enhanced production.

Prior to 1986, with the higher price of crude there was an incentive to launch projects to escape the windfall profit tax with enhanced production. Secondly, there are now simply more larger projects. There are seven capable of over 1,000 b/d in this compilation vs. only two in 1986. The largest is Marathon Oil's Oregon basin, Wyo., Setpa project rated at 3,000 b/d of enhanced production.

Carbon dioxide

The large jump in CO_2 miscible EOR of nearly 36,000 bo/d, representing a 125% increase over 1986, has been in the offing since three large trunk lines began trans-

Table B

Planned projects outside U.S. by country

Operator	Project type	Field	Country	Size, acres	Pay zone	Depth, ft	Gravity, °API	Target date
Vikor	CO_2 miscible	Joffre	Canada/Alta.	640	Viking - Phase II	5,000	42.0	1988
Shell Canada*	CO_2 miscible	Harmatton East	Canada/Alta.	2,210	Turner Valley	8,600	38.6	Mid 1988
Canada Northwest Energy*	Electromagnetic heating	Frog Lake	Canada/Alta.	120	Sparky	1,500	12.0	9/88
Amoco Canada*	HC miscible	Pembina	Canada/Alta.	1,400	Cardium	5,100	38.0	Mid 1989
Amoco Canada*	HC miscible	Nipisi	Canada/Alta.	8,640	Gilwood	5,500	41.0	4/88
Canada Northwest Energy*	HC miscible	Morinville	Canada/Alta.	160	D3	5,200	28.0	4/89
Canterra Energy*	HC miscible	Bigoray K	Canada/Alta.	200	Nisku	7,500	35.0	Mid 1988
Canterra Energy*	HC miscible	Rainbow South S	Canada/Alta.	100	Keg River	6,000	42.0	Mid 1988
Chevron Canada	HC miscible	Bigoray D	Canada/Alta.	400	Nisku D	11,000	38.0	1/89
Chevron Canada	HC miscible	Brazeau River I	Canada/Alta.	250	Nisku I	10,000	45.0	3/88
Chevron Canada*	HC miscible	Kaybob	Canada/Alta.	4,100	Beaverhill Lake A	10,000	36.0	7/88
Chevron Canada	HC miscible	Mitsue	Canada/Alta.	2,132	Gilwood-Stage 1 Expan.	5,000	41.0	7/88
Chevron Canada	HC miscible	Mitsue	Canada/Alta.	5,152	Gilwood-Stage 3	5,000	41.0	7/89
Gulf Canada*	HC miscible	Fenn-Big Valley	Canada/Alta.	2,246	Nisku	5,249	32.8	1989
Gulf Canada*	HC miscible	Fenn-Big Valley	Canada/Alta.	3,000	Nisku	5,249	32.8	1991
Gulf Canada*	HC miscible	Fenn-Big Valley	Canada/Alta.	1,300	Nisku	5,249	32.8	1992
Home Oil*	HC miscible	Swan Hills	Canada/Alta.	8,240	Beaverhill Lake	8,700	39.0	5/88
Mobil Oil Canada*	HC miscible	Carson Creek North	Canada/Alta.	5,760	Beaverhill Lake	6,700	43.7	Late 1989
Shell Canada*	HC miscible	Virginia Hills	Canada/Alta.	6,080	Beaverhill Lake	9,200	38.0	Late 1989
Canada Northwest Energy*	Steam	Atlee Buffalo	Canada/Alta.	40	Glauconite	2,900	14.5	1/89
Mobil Oil Canada	Steam	Cold Lake	Canada/Alta.	160	Lower Grand Rapids	1,200	12.0	3/88
Norcen*	Steam	Cold Lake	Canada/Alta.	50	Clearwater	1,450	11.0	12/88
Suncor*	Steam	Burnt Lake	Canada/Alta.	660	Clearwater	1,600	11.0	
Canada Northwest Energy*	Electromagnetic heating	Tangleflags	Canada/Sask.	80	Sparky	1,700	13.8	4/88
Canada Northwest Energy*	Electromagnetic heating	Northminster	Canada/Sask.	160	Sparky	1,750	14.9	4/88
Mobil Oil Canada	Steam	Celtic	Canada/Sask.	160	Gen. Petroleum Waseca	1,650	12.0	1988
Phillips Petroleum	Steam	Coleville	Canada/Sask.		Bakken	2,600	14.0	1989
NKFV	C_2 rich gas inj.	Algyo	Hungary	400	Tisza-2	5,700	47.0	1988
OKGT	CO_2 gas cap	Nagylengyel	Hungary	3,000	I-IV Rudistid	6,000	27.0	1988
NKFV	Steam	Demjen-West	Hungary	15	Rupelien 3/B	1,000	30.0	1988
Trintoc*	Steam	Point Fortin	Trinidad	30	Cruse Sands	1,600-1,800	16-18.0	1988
Trintoc*	Steam	Forest Reserve	Trinidad	52	Forest Sands	1,000-1,200	16-18.0	1989
Corpoven	Steam	El Pao	Venezuela	15	U-1,2,3	1,800	8.5	6/88
Mobil Oil AG*	Polymer	Voigter	West Germany	870	Cornbrash	1,300-1,600	35.0	1989
BEB	Steam	Ruhlermoor SD-3	West Germany Emsland	370	Valanginian	1,670-2,165	25.0	1988
Wintershall AG*	Hot water	Emlichheim	West Germany Saxony	430	Valenginian	2,600	24.5	1988

*Project for which investment data were available.

porting Colorado and New Mexico carbon dioxide into the Permian basin in 1984. Table F includes details on existing CO_2.

The three major pipelines moving CO_2 into the Permian basin are the 30-in. Cortez line operated by Shell Pipe Line Co.; the 24-in. Sheep Mountain line operated by ARCO, and the 20-in. Bravo Dome line operated by Amoco Pipeline Co. The latter brings in the gas from New Mexico. All three terminate in the Denver City, Tex., area. Further pipeline construction within the basin has spurred carbon dioxide EOR projects in the area.

Enron has built the Central Basin line stretching from the Denver City area in Yoakum County some 150 miles south to the Yates field in Pecos County. It ties in to the 16-in. Sacroc CO_2 line which could be tied in and make a major source of CO_2 available to an even larger part of West Texas. Chevron's Sacroc line originally took carbon dioxide from a Pecos County gas processing plant to Kelly-Snyder and Diamond M fields in Scurry County, Tex.

Big Three Industries Inc.'s West Texas Carbon Dioxide Pipeline is also taking carbon dioxide south from the Denver City area. It terminates at another CO_2 line laid to transport carbon dioxide to Conoco's Ford Geraldine field in Reeves County. The route of this pipeline opened another part of the Permian basin to CO_2 EOR.

This will be a major factor there for the next 20 to 30 years, and with so much infrastructure in place it is likely production will rise even as the price of crude languishes. With a little help from oil markets, this region could "go critical" in CO_2 EOR activity and production.

Carbon dioxide, which can in the wrong location still spoil the economics of a gas field, is becoming a valuable commodity, certainly in West Texas. Other oil regions, like the Canadian province of Saskatchewan, would also welcome an abundent and affordable source of CO_2.

Amoco Corp., for example, now gives carbon dioxide reserves and production figures in its annual report. Production last year was 222 MMcfd compared to 33 MMcfd in 1984. Amoco is also tapping other sources of carbon dioxide in West Texas. It has a plant in the Wasson field in the Permian basin separating carbon dioxide for injection from natural gas. It has two separation plants (one nearing start-up early last month) in the nearby Slaughter field even

Table 1

U.S. EOR production

	b/d					Change from 1986, %
	1980	1982	1984	1986	1988	
Thermal						
Steam	243,477	288,396	358,115	468,692	455,484	−2.8
Combustion in situ	12,133	10,228	6,445	10,272	6,525	−36.5
Hot water	—	—	—	705	2,896	+310.8
Total thermal	**255,610**	**298,624**	**364,560**	**479,669**	**464,905**	**−3.1**
Chemical						
Micellar-polymer	930	902	2,832	1,403	1,509	+7.6
Polymer	924	2,927	10,232	15,313	20,992	+37.1
Caustic/alkaline	550	580	334	185	0	−100.0
Total chemical	**2,404**	**4,409**	**13,398**	**16,901**	**22,501**	**+33.1**
Gases						
Hydrocarbon miscible/immiscible	—	—	14,439	33,767	25,935	−23.2
CO_2 miscible	21,532	21,953	31,300	28,440	64,192	+125.7
CO_2 immiscible	—	—	702	1,349	420	−68.9
Nitrogen	—	—	7,170	18,510	19,050	+2.9
Flue gas (miscible and immiscible)	—	—	29,400	26,150	40,450	+54.7
Total gases	**74,807**	**71,915**	**83,011**	**108,216**	**150,047**	**+38.7**
Other						
Carbonated waterflood	—	—	—	—	—	—
Grand total	**332,821**	**374,948**	**460,969**	**504,786**	**637,453**	**+5.4**

Producing Canadian EOR projects*

Operator	Field	Province	Start date	Area, acres	Number wells – Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Alkaline										
Dome Petroleum	David	Alta.	1986	245	22	7	Lloydminster	S	29.0	1,480
CO_2 miscible										
Shell Canada	Midale	Sask.	10/85	5	3	4	Midale	LS/Dolo.	16.0	3
Vikor	Joffre Viking	Alta.	12/82	320	5	5	Viking	S	13.0	500
Vikor	Joffre Viking	Alta.	8/85	640	6	3	Viking	S	13.0	500
Caustic										
Dome Petroleum	Cessford	Alta.	7/84	680	19	7	Basal Colorado	S	24.0	350
Caustic-polymer										
Pancanadian	Horsefly Lake	Alta.	12/84	34	5	4	Lower Mannville	S	18.0	260
Combustion										
Husky	Tangleflags	Sask.	1985	240	19	3	GP	US	33.0	4,000
Mobil Oil Canada	Battrum	Sask.	10/66	4,920	87	13	Battrum/Roseray	S	26.0	1,265
Mobil Oil Canada	Battrum	Sask.	8/67	2,400	47	5	Battrum/Roseray	S	25.0	930
Mobil Oil Canada	Kitscoty	Alta.	1977	1,040	84	7	Sparky	S	34.0	2,000
Mobil Oil Canada	Fosterton Northwest	Sask.	1/70	200	6	4	Roseray	S	29.0	958
Mobil Oil Canada	Battrum	Sask.	11/65	680	24	3	Roseray	S	27.0	930
Pancanadian	Countess Upper Mannville B Pool	Alta.	1/83	40	4	2	Glauconite S.S.	S	25.0	800
Murphy	Evehill	Sask.	9/81	180	16	9	Cummings Waseca	S	34.0	6,000
Electromagnetic heating										
Canada Northwest Energy	Wildmere	Alta.	1/86	120	3		Lloydminster	S	30.0	800
Foam flood										
Signalta Resources	Pembina	Alta.	10/86	2,240	13	1	Ostracod	S	12.0	70

Table 2

Active U.S. EOR projects

	Number of projects									Change from 1986,
	1971	1974	1976	1978	1980	1982	1984	1986	1988	%
Thermal										
Steam	53	64	85	99	133	118	133	181	133	– 26.5
Combustion in situ	38	19	21	16	17	21	18	17	9	– 47.1
Hot water	—	—	—	—	—	—	—	3	10	+233.3
Total thermal	91	83	106	115	150	139	151	201	152	– 24.4
Chemical										
Micellar-polymer	5	7	13	22	14	20	21	20	9	– 55.0
Polymer	14	9	14	21	22	55	106	178	111	– 37.6
Caustic/alkaline	—	2	1	3	6	10	11	8	4	– 50.0
Total chemical	19	18	28	46	42	85	138	206	124	– 39.8
Gases										
Hydrocarbon miscible-immiscible	21	12	15	15	9	12	16	26	22	– 15.4
CO_2 miscible	1	6	9	14	17	28	40	38	49	+ 28.9
CO_2 immiscible	—	—	—	—	—	—	18	28	8	– 71.4
Nitrogen	—	—	—	—	—	—	7	9	9	0
Flue gas (miscible and immiscible)					8	10	3	3	2	– 33.3
Total gases	—	—	—	—	34	50	84	104	90	– 13.5
Other										
Carbonated waterflood								1	0	–100.0
Grand total					226	274	373	512	366	– 28.5

though the Bravo line cuts right through this field.

The Permian basin is now the world leader in CO_2 EOR. Even further infrastructure for EOR production is being added. Chevron U.S.A. kicked off the world's first CO_2 EOR in 1972 at the Sacroc unit, but earlier this year announced a three stage project for the North Ward Estes field of Ward and Winkler Counties, Tex. The new project could ultimately recover 65 million bbl of oil and 32 bcf of gas with a miscible carbon dioxide EOR project.

The $75 million first stage, which will involve 6 sq miles in the field, will require a 26-mile, 12-in. pipeline to the field from the existing Central Basin CO_2 pipeline.

Texas, of course, doesn't have a monopoly on CO_2 EOR projects. Exxon Co. U.S.A.'s 112-mile, 20-in. CO_2 line from Green River to Bairoil, Wyo., opened the door for Amoco to begin injection into the Wertz field Tensleep formation in 1986. The Lost Soldier field in that area is targeted for injection this year.

Outlook for the future

In 1986, the Journal's EOR survey was virtually complete before the full import of the crude oil price plunge was known. It is therefore no wonder that of the 108 projects listed for completion during 1986 and 1987, few survived. Since the beginning of 1986 to early 1988, only 31 new projects were initiated. Planned polymer projects took the biggest hit. Almost half of those delayed or canceled were polymer projects.

Of the 38 planned, only one has been started. Six still remain as future projects in the current survey. One additional polymer project not in the 1986 survey was started in 1987. Planned immiscible CO_2 projects also took their lumps. Some 27 were cancelled by Texaco offshore Louisiana. The largest cancellation in this category in terms of acreage was Amoco's 16,340-acre Levelland, Tex., project. Of the 43 CO_2 projects listed as planned in 1986, only 9 have survived (5 were started up and four are included in the 15 still listed as planned).

Steam projects, however, bucked the trend. There are now 38 planned compared with 25 two years ago. Of the 38 now listed, 15 of them were also listed 2 years ago which raises a question about the viability of some of them. ▪

Table C

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F.	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project maturity	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
2,450	22.0	34	75	Prim./WF	60.0		JS	1,360		TETT		FW
4,600	28.0	3.00	150	Prim./WF	35.0		NC					P
4,900	42.0	1.14	133	WF	38.0	25.0	HF			Prom.		P (Exp. L)
4,900	42.0	1.14	133	WF	38.0	27.0	JS			Prom.		
3,000	24.0	24	84	Prim./WF	62.0		HF	340	100	Prom.	Yes	P (Exp. L)
3,200	23.0	13.40	94	WF	51.0	40.0	NC					
1,700	14.5	4,000	74	Prim.	77.0		JS	550	550	Succ.	Yes	P (Exp. UL)
2,900	18.0	70.30	110	Prim.	66.0		HF	3,585	3,585	Succ.	Yes	FW
2,900	18.0	70.00	110	Prim.	62.0		HF	1,460	1,460	Succ.	Yes	FW
1,800	12.2	15,000	70	Prim.	85.0	60-68	HF	650	325	Disc.		P
3,100	24.0	16.00	125	WF	62.0	40.0	HF	138	138	Prom.	No	P (Exp. UL)
2,900	18.0	70.00	110	Prim.	70.0		HF	1,400	1,400	Succ.	Yes	FW
3,550	28.0	6.00	100	WF	45.0	25.0	NC					
2,450	14.3	2,750	70	Prim.	100.0	80.0	HF	350	350	Prom.	Yes	P (Exp. UL)
2,100	12.0	8,000	75	Prim.	85.0		JS	80	60	Prom.	Yes	P (Exp. L)
5,659	42.0	0.35		Gas injection	78.0	31.0	HF	168	168	Prom.	Yes	FW

Producing Canadian EOR projects* — continued

Operator	Field	Province	Start date	Area, acres	Number wells – Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Hydrocarbon miscible										
Amoco Canada	Ante Creek Unit 1	Alta.	1968	6,080	13	9	Beaverhill Lake	LS	6.0	9
Amoco Canada	Nipisi	Alta.	2/84	16,640	105	26	Gilwood		18.0	200
Amoco Canada	South Swan Hills	Alta.	1973	28,480	166	49	Beaverhill Lake		8.0	49
Amoco Canada	Bigoray Nisku B	Alta.	2/80	251	3	1	Nisku D-2	LS	5.0	1,130
Amoco Canada	Rainbow S.	Alta.	8/72	490	5	2	Keg River	Dolo.	6.0	40
Canterra Energy	Rainbow KRD Pool	Alta.	3/76	85	1	1	Keg River	LS	10.0	200
Canterra Energy	Rainbow H Pool	Alta.	6/73	165	3	1	Keg River	LS	9.4	200
Canterra Energy	Rainbow Lake	Alta.	6/84	2,500	28	9	Keg River	LS	8.0	300
Canterra Energy	Rainbow E Pool	Alta.	6/72	173	5	1	Keg River	LS	12.0	300
Canterra Energy	Rainbow G Pool	Alta.	10/72	163	2	1	Keg River	LS	8.0	300
Canterra Energy	Rainbow O Pool	Alta.	2/70	703	9	1	Keg River	LS	6.0	150
Canterra Energy	Rainbow KRA Pool	Alta.	12/68	633	17	2	Keg River	LS	10.1	100
Canterra Energy	Rainbow EEE Pool	Alta.	4/70	150	2	1	Keg River	LS	16.8	500
Chevron Canada Resources	Mitsue, Stage 1 & 2	Alta.	5/85	17,280	71	27	Gilwood	S	13.4	282
Chevron Canada Resources	Pembina Nisku F	Alta.	12/87	200	3	1	Nisku F	LS	12.7	660
Chevron Canada Resources	Acheson D-3A	Alta.	7/87	610	15	1	Leduc D3	LS	12.0	5,000
Chevron Canada Resources	Bigoray Nisku F	Alta.	3/87	150	2	1	Nisku F	LS	10.0	250
Chevron Canada Resources	W. Pembina Nisku A	Alta.	8/81	200	2	1	Nisku A	LS	10.0	750
Chevron Canada Resources	W. Pembina Nisku D	Alta.	5/81	320	2	1	Nisku D	LS	10.0	300
Chevron Canada Resources	Pembina Nisku A	Alta.	2/84	400	3	1	Nisku A	LS	8.0	250
Chevron Canada Resources	W. Pembina Nisku C	Alta.	4/84	130	2	1	Nisku C	LS	11.0	1,100
Chevron Canada Resources	Pembina Nisku D	Alta.	11/85	400	5	1	Nisku	LS	12.0	750
Dome Petroleum	Kaybob South	Alta.	7/84	8,000	40	9	Triassic	Dolo.	11.5	92
Dome Petroleum	Willesden Green	Alta.	1977	26,000	110	46	Cardium	S	11.0	5
Gulf Canada	Fenn-Big Valley	Alta.	4/83	1,268	26	7	Nisku	Dolo.	8.0	400
Gulf Canada	Goose River	Alta.	10/86	2,847	14	5	Beaverhill Lake	LS	8.0	240
Home Oil	Swan Hills	Alta.	10/85	11,520	86	23	Beaverhill Lake	LS	8.5	54
Mobil Oil Canada	Rainbow	Alta.	7/83	110	4	1	Keg River	Dolo./LS	9.8	1,000-4,000
Mobil Oil Canada	Rainbow	Alta.	9/72	360	14	2	Keg River	Dolo./LS	8.6	7,000
Petro-Canada	Brazeau River	Alta.	9/81	640	3	1	Nisku	LS	7.0	50
Petro-Canada	Caroline	Alta.	9/84	12,620	27	12	Cardium	S	10.0	12
Petro-Canada	Brazeau River	Alta.	9/80	640	2	1	Nisku	LS	10.0	396
Petro-Canada	Brazeau River	Alta.	11/80	640	2	1	Nisku	LS	10.0	35
Shell Canada	Simonette	Alta.	11/86	150	4	1	Leduc D-3	Dolo.	7.0	10-50
Texaco Canada Resources	Wizard Lake	Alta.	1969	2,725	49	14	Leduc D-3A	Dolo.	9.6	1,375
Texaco Canada Resources	Pembina 'K' Pool	Alta.	1980	126	2	1	Nisku	Dolo.	12.7	2,020
Texaco Canada Resources	Pembina 'Q' Pool	Alta.	1985	301	2	1	Nisku	Dolo.	9.8	1,970
Texaco Canada Resources	Pembina 'M' Pool	Alta.	1983	192	2	1	Nisku	Dolo.	9.0	540
Texaco Canada Resources	Pembina 'L' Pool	Alta.	1985	625	4	2	Nisku	Dolo.	10.5	1,060
Texaco Canada Resources	Pembina 'O' Pool	Alta.	1983	346	1	1	Nisku	Dolo.	11.8	3,100
Texaco Canada Resources	Pembina 'G' Pool	Alta.	1981	328	3	1	Nisku	Dolo.	8.0	900
Texaco Canada Resources	Pembina 'P' Pool	Alta.	1983	420	3	1	Nisku	Dolo.	10.3	2,400
Natural gas immiscible										
Home Oil	Silverdale	Sask.	12/85	160	9	3	Sparky	S	29.0	2,000
Polymer										
Chevron Canada Resources	Taber Mannville D Unit 1	Alta.	6/87	480	7	2	Mannville D	S	22.3	1,140
Encor Energy	Rapdan Unit	Sask.	1/86	440	12	5	Upper Shaunavon	S	17.0	85
Steam										
Amoco Canada	Elk Point	Alta.	1987	33	9	4	Lower Cummings	S	30.0	1,500
Canada Northwest Energy	Atlee Buffalo	Alta.	9/86	640	10		Glauconite	S	30.0	2,000
Home Oil	Kitscoty	Alta.	1981	160	9	9	Sparky B	S	27.6	905
Husky	Westhazel	Sask.	1985	0	0	0	GP	US	33.0	5,000
Husky	Aberfeldy	Sask.	1979	63	24	5	Sparky	US	30.0	1,700
Koch Exploration Canada	Fort Kent	Alta.	12/85	160	13		Upper Grand Rapids	S	35.0	
Mobil Oil Canada	Celtic	Sask.	4/85	50	5		General Petro.	S	35.0	2,000
Mobil Oil Canada	Cold Lake	Alta.	1982		3		Lower Grand Rapids	S	35.0	1,000
Mobil Oil Canada	Celtic	Sask.	10/80	125	25		Waseca	S	35.0	1,000
Norcen	Provost	Alta.	1985	20	9	9	McLaren	S	27-30.0	4,000
Phillips Petroleum	Coleville	Sask.	1984	35	2	2	Bakken	S	25.0	400
Sceptre Resources	Tangleflags North	Sask.	12/87	17	1	3	Lloydminster Sand	US	32.5	
Texaco Canada Resources	Lone Rock	Sask.	11/84	45	13	3	Sparky	S	34.4	2,800
Westmin Resources	Lindbergh	Alta.	1985	40	8	1	Basal Mannville	S	30.0	3,000
Westmin Resources	Lindbergh	Alta.	1985	160	16		Basal Mannville	S	30.0	3,000

Producing EOR projects outside U.S. and Canada

Country	State area	Operator	Project type	Field	Start date	Area, acres	Number wells Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Austria		OMV	Caustic	Matzen/Scho	7/80	33	5	1	Torton 9th	S	23.5	300
Austria		OMV	Steam	Maustrenk	7/80	123	19	3	Schlier		24.0	147
Colombia	Middle Magdalena Basin	Texas Petroleum	Steam	Teca	2/84	3,000	200		Oligocene A & B	S	28.0	1,200
Colombia	Middle Magdalena Basin	Texas Petroleum	Steam	Cocorna	3/87	15	8	3	Oligocene B	S	28.0	700
Congo		Elf Congo	Steam	Emeraude-Offshore	1985	9	8	2	Senonien	S	25.0	80

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project maturity	Total prod. b/d	Enhanced prod. b/d	Project eval.	Profit	Project scope
11,000	40.0	0.14	233	Prim.	90.0	60.0	HF	1,230	1,230	Succ.	Yes	FW
8,500	41.0	0.84	131	WF	30.0	5.0	JS	17,000	3,000	Succ.	Yes	FW
8,500	38.0	0.40	225	Prim./WF	35.0	13.0	NC	17,925	17,925	Succ.	Yes	FW
7,500	34.0	1.40	169	Prim.	0.7	0.3	HF	800	800	Succ.	Yes	FW
6,200	40.0	0.30	183	Prim.			NC	1,900	1,900	Succ.	Yes	FW
6,310	40.0	0.426	195	Prim.	90.0	27.0	NC	180	180	Succ.	Yes	FW
6,210	39.0	0.596	187	Prim.	92.0	28.0	HF	1,500	1,500	Succ.	Yes	FW
6,000	39.0	0.83	180	WF	52.0	23.0	JS	8,000	3,000	Prom.	Yes	FW
5,932	39.0	0.439	175	Prim.	91.0	27.0	HF	3,200	3,200	Succ.	Yes	FW
6,151	39.0	0.485	185	Prim.	92.0	28.0	HF	750	750	Succ.	Yes	FW
6,053	42.0	0.28	180	Prim.	87.0	26.0	NC	950	950	Succ.	Yes	FW
6,380	43.0	0.29	195	Prim.	90.0	30.0	HF	5,030	5,030	Succ.	Yes	FW
6,085	37.0	0.542	180	Prim.	95.0	29.0	NC	200	200	Succ.	Yes	FW
5,000	41.0	0.65	147	WF	30.0	19.0	JS	10,250	4,350	Succ.	Yes	FW
8,000	40.0	0.50	208	WF	75.0	43.3	JS	285	0	TETT	TETT	P (Exp. L)
5,000	39.0	0.85	139	Prim.	90.0	29.0	JS	2,400	1,400	TETT		FW
10,500	37.0	0.80	175	WF	90.0	5.0	JS	4,000	1,100	Succ.	Yes	FW
10,000	42.0	0.30	228	Prim.	90.0	5.0	HF	3,700	2,000	Succ.	Yes	FW
10,000	42.0	0.20	218	Prim.	90.0	5.0	HF	3,000	1,500	Succ.	Yes	FW
10,000	41.0	0.30	210	WF	80.0	5.0	JS	3,650	900	Succ.	Yes	FW
10,300	42.0	0.30	218	WF	75.0	9.0	HF	6,000	2,500	Prom.	Yes	FW
9,000	41.0	0.70	176	WF	90.0	5.0	JS	6,400	1,700	Succ.	Yes	FW
6,981	40.0	0.419	190	WF	46.0	31.0	HF	4,500	950	Prom.	Yes	FW
6,400	38.0	0.55	136	Prim.	87.0	73.0	NC	2,000	700	Disc.	No	FW
5,249	32.8	1.34	136	Prim.	33.0		JS	623	623	Succ.	Yes	FW
9,200	41.0	0.4	234	WF			JS	3,800	0	TETT		FW
8,700	39.0	0.4		WF	30.0	5.0	JS	13,000	3,800	Succ.	Yes	FW
5,500	39.0	0.46	190	WF	0.4	0.1	HF	283	283	Prom.	Yes	FW
5,500	39.0	0.47	184	Gas/WF	0.8	0.1	HF	2,500	2,500	Succ.	Yes	FW
10,091	42.0	0.38	216	Prim.	90.0	15.0	HF	3,100	3,100	Succ.	Yes	FW
8,200	46.0	0.25	173	Prim.	85.0	45.0	HF	1,900	1,550	Succ.	Yes	FW
10,215	44.0	0.40	218	Prim.	90.0	10.0	HF	7,400	7,400	Succ.	Yes	FW
10,544	46.0	0.20	222	Prim.	90.0	15.0	HF	2,500	2,500	Succ.	Yes	FW
11,600	47.0	0.13		WF			JS	170	0	TETT		
6,500	38.0	0.88	167	Prim.	93.0	3.8	HF	28,000	28,000	Succ.	Yes	FW
9,469	43.6	0.37	198	Prim.	82.0	5.0	JS	2,010	860	Prom.	Yes	FW
9,421	41.3	0.42	196	Prim.	91.0	5.0	JS	2,700	1,410	Prom.	Yes	FW
9,336	41.1	0.14	198	Prim.	93.0	5.0	JS	2,460	1,150	Prom.	Yes	FW
9,415	40.9	0.42	199	WF	88.0	5.0	JS	3,770	1,470	Prom.	Yes	FW
9,332	43.4	0.32	190	Prim.	84.0	5.0	JS	1,250	540	Prom.	Yes	FW
9,541	43.2	0.33	204	Prim.	80.0	5.0	JS	2,500	1,100	Prom.	Yes	FW
9,531	45.4	0.36	200	Prim.	87.0	5.0	JS	4,110	1,920	Prom.	Yes	FW
560	16.0	5,000		Prim.	82.0	74.6	HF	75	75	Prom.	Yes	P (Exp. UL)
3,200	18.0	55	121	WF	92.0	7.0	JS	17,600	16,400	Succ.	Yes	FW
4,500	23.0	10	132	WF	55.0	43.0	JS	470	350	Prom.	Yes	P (Exp. L)
2,000	12.0	30,000	73	Prim.			JS	400		TETT		P
2,900	14.5	800	80	Prim.	80.0	1.0	JS	1,000	1,000	Succ.	Yes	P (Exp. L)
2,066	13.0	3,000		Prim.	80.0	52.0	HF	725	575	Succ.	Yes	P (Exp. L)
1,575	13.6	18,000	70	Prim.	82.0		JS			TETT	TETT	P (Exp. UL)
1,700	17.0	800	70	Prim./WF	71.0	43.0	HF	1,000	1,000	Prom.	No	P (Exp. UL)
1,000	11.0	21,300		None	12.0		HF	0	0	Prom.		P
1,576	13.0	7,000	67	Prim.	69.0	46.0	JS	290	290	Prom.	Yes	P (Exp. L)
1,200	10-12.0	20000-100000	60	None	65.0	50.0	NC	100	100	Prom.		
1,500	13.0	5,380	61	Prim.	70.0	47.0	HF	630	630	Prom.	Yes	P (Exp. L)
2,430	12.0	2,000	80	Prim.	82.0	45.0	HF	600	600	Prom.	No	P (Exp. L)
2,600	14.0	1,000		WF			NC	60	22	Prom.	No	P
1,476	12-13.0	13,000	66	Prim.	80.0	15.0	JS			TETT		P
1,900	16.0	800	70	Prim.	82.0		HF			Prom.	TETT	P (Exp. L)
1,900	12.0	1,200		Prim.	70.0	55.0	JS	500		TETT	TETT	P (Exp. UL)
1,900	12.0	1,200		Prim.	70.0	55.0	JS	500	400	TETT	Yes	P (Exp. UL)

Table D

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
4,330	21.0	12.7		Prim./WF	62.0	43.0	NC	78	21	Succ.	Yes	P (Exp. L)
3,018	26.0	7.81		Prim./WF	51.0	46.0	NC	84	5.4	TETT	No	FW
1,600	12.8	2,965		Prim.	60.0		HF	17,000	8,500	Succ.	Yes	FW
2,100	12.8	2,965		Steam soak	57.0	19.0	JS	300	50	Prom.		P (Exp. L)
600	22.0	100	85	Prim.			HF	1,600	1,600	Prom.		P

Producing EOR projects outside U.S. and Canada — continued

Country	State/area	Operator	Project type	Field	Start date	Area, acres	Number wells Prod.	Number wells Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
England		BP	Micellar-polymer	Bothamsall	7/83	10	3	1	Sub-Alton	S	12.0	14
France		Elf Aquitaine	Micellar-polymer	Chateaurenard	1984	71	9	4	Neocomian	S	30.0	1,300
France		Elf Aquitaine	Polymer	Chateaurenard	1985	12	4	1	Neocomian	S	30.0	1,000
France		Elf Aquitaine	Steam	Lacq Superieur	1977	30	8	1	Senonien	LS	15.0	1
Hungary		NKFV	CO_2	Nagylengyel	9/80	200	5	1	Triassic	LS		1,000
Hungary		NKFV	CO_2	Budafa	1981	1,013	77	60	Zala Kerettye	S	22.0	110
Hungary		NKFV	Combustion	Demjen East	1986	13.6	6	3	Oligocene c,da,df,e	S	19.0	100
Indonesia		Total	Micellar-polymer	Handil	1982	4	1	3		S	30.0	1,000
Trinidad		Trintoc	CO_2 push-pull	Forest Reserve	5/84		17		Forest Sands	S	30.0	150-300
Trinidad		Trintoc	Steam	Forest Reserve	8/76	58	4	1	Forest Sand	S	31.0	205
Trinidad		Trintoc	Steam	Point Fortin Central	2/86	32	15		Cruse E	S	31.0	95
Trinidad	Point Fortin	Trintoc	Steam	Parrylands	7/82	90	46		Forest Sands	S	30.0	500
Trinidad		Trintoc	Steam	Forest Reserve	7/65	135	50	14	Forest Zone 5.1	S	33.0	340
Venezuela	Anzoategui	Corpoven S.A.	Gas	Oveja	5/64	1,686	12	2	L-1L	S	30.4	2,642
Venezuela	Anzoategui	Corpoven S.A.	Gas	Oveja	8/61	5,467	3	3	I-2L,3	S	37.0	2,500
Venezuela	Anzoategui	Corpoven S.A.	Gas	Oveja	1/67	1,325	9	1	L-1L	S	31.0	2,940
Venezuela	Anzoategui	Corpoven S.A.	Gas	Oveja	1/64	2,422	18	2	J-3	S	28.0	3,000
Venezuela	Monagas	Corpoven S.A.	Gas	Oritupano	2/79	1,052	8	1	A-9	S	28.0	1,300
Venezuela	Monagas	Corpoven S.A.	Gas	Oritupano	9/76	1,054	6	1	A-7	S	30.0	300
Venezuela	Anzoategui	Corpoven S.A.	Steam	F.P.O.			7	7	U-1 (OS-721)	S	27.9	2,000
Venezuela	Anzoategui	Corpoven S.A.	Steam	Mezones	4/83	57,314	14	14	U-1,2,3	S	34.0	1,200
Venezuela	Anzoategui	Corpoven S.A.	Steam	F.P.O.			13	13	U-23 (MFB-53)	S	31.9	1,400
Venezuela	Anzoategui	Corpoven S.A.	Steam	F.P.O.			4	4	S-3,4 (MBA-8)	S	30.7	5,800
Venezuela	Anzoategui	Corpoven S.A.	Steam	F.P.O.			58	58	U-3,4 (MFB-24)	S	28.6	5,000
Venezuela	Anzoategui	Corpoven S.A.	Steam	Arecuna	12/83	500	15	15	T	S	30.0	2,500
Venezuela	Campo Cerro Negro	Lagoven S.A.	Steam	B.E.P.-Cerro Negro	1984	49,090	144		Ofic. Morichal-Memb.	S	32.0	7,000
Venezuela	Campo Jobo	Lagoven S.A.	Steam	Jobo Pico	3/81	90	22	6	Morichal-1	S	32.0	10,0
Venezuela	Campo Jobo	Lagoven S.A.	Steam	Jobo	12/69	4,329	18		Ofic. Jobo Member	S	32.0	2,500
Venezuela	Campo Jobo	Lagoven S.A.	Steam	Jobo - P.E.T.C.	8/85	267	17		Oficina	S	30.0	8,000
Venezuela	Campo Jobo	Lagoven S.A.	Steam	Jobo	12/69	27,522	99		Ofic. Mor-Member	S	31.0	5,000
Venezuela	Campo Pilon	Lagoven S.A.	Steam	West Pilon	12/69	1,065	29		Oficina-1	S	29.1	5,000
Venezuela	Zulia	Lagoven S.A.	Steam	Bachaquero	12/80	343	2		Bachaquero Superior	S	23.0	1,500
Venezuela	Zulia	Lagoven S.A.	Steam	Lagunillas	2/71	9,343			Bachaquero	S	34.0	4,000
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	3/69	1,773	145		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	4/65	420	59		U.L.H.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	4/59	339	33		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	8/69	415	24		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	11/79	3,101	267		L.L.	S	33.7	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	9/64	415	36		L.L.	S	38.1	3,000
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	10/63	873	82		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	8/68	2,629	224		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	8/69	1,642	131		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	4/70	2,565	220		U.L.H.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	7/67	1,271	114		L.L.	S	38.1	675
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	7/67	1,500	134		L.L.	S	38.1	750
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	6/68	141	15	7	L.L.	S	33.0	
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	10/67	2,221	197		L.L.	S	38.1	750
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	1/70	3,025	147		L.L.	S	33.7	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	1/74	1,830	135	21	L.L.	S	38.1	780
Venezuela	Zulia	Maraven S.A.	Steam	Bachaquero	10/84	7,795	539		Post-Eoceno	S	37.3	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	2/61	36	7		L.L.	S	38.0	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	7/67	618	54		U.L.H.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	Main Tia Juana	6/66	141	15		L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	11/80	3,565	299		U. H.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	8/70	2,114	175		U.	S	35.0	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	5/68	2,667	232		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	East Tia Juana	12/68	1,956	168		L.L.	S	38.1	
Venezuela	Zulia	Maraven S.A.	Steam	Lagunillas	1/70	76	7		L.L.	S	33.7	
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 15	1/67	115	15	2	Valenginian	S	30.0	6,000
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 14	10/67	64	8	1	Valenginian	S	30.0	6,000
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 17	10/74	81.5	10	2	Valenginian	S	30.0	6,000
West Germany		Wintershall AG	Hot water flood	Ruehlertwist	12/86	53	10	2	Valenginian	S	30.0	400
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 10	11/81	41.5	6	1	Valenginian	S	30.0	6,000
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 11	9/73	70	8	1	Valenginian	S	30.0	6,000
West Germany	Lower Saxony	Wintershall AG	Hot water flood	Emlichheim 07	10/67	81.5	10	1	Valenginian	S	30.0	6,000
West Germany		Texaco AG	Polymer	Hankensbuettel Westblock 4	4/77	165	7	2	Upper Dogger-Beta	S	28.0	2,000-4,000
West Germany		Texaco AG	Polymer	Hankensbuettel Westblock 2	5/79		6	3	Upper Dogger-Beta	S	28.0	2,000-4,000
West Germany	Northwest	Preussag AG	Polymer	Edesse-Nord	11/85	4.2	3	2	Wealden	S	24.0	1,200
West Germany	Lower Saxony	Wintershall AG	Polymer	Bockstedt	9/84	57	5	1	Valenginian	S	23.0	4,000
West Germany		Texaco AG	Polymer	Oerrel Westblock 4	1980	410	13	3	Upper Dogger-Beta	S	28.0	2,000-4,000
West Germany	Emsland	BEB	Steam	Ruhlermoor	8/86	300	30	4	Valanginian	S	27-31.0	600-1000
West Germany	Lower Saxony	BEB	Steam	Georgsdorf	1/75	165	19	2	Valanginian	S	25.0	460-1150
West Germany	Lower Saxony	BEB	Steam	Georgsdorf	12/79	144	23	3	Valanginian	S	25.0	1000-1300
West Germany	Lower Saxony	BEB	Steam	Ruhlermoor	11/80	230	24	4	Valanginian	S	28-30.0	300-1000
West Germany	Lower Saxony	Wintershall AG	Steam	Ruehlertwist	12/78	237	24	2	Valenginian	S	28.0	5,000
West Germany	Lower Saxony	Wintershall AG	Steam	Emlichheim 06	5/81	121	25	4	Valenginian	S	30.0	6,000
West Germany		Texaco AG	Surfactant	Hankensbuettel Westblock 4	1982	83	7	3	Lower Dogger-Beta	S	28.0	300-1,000

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F.	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
3,140	41.0	3	110	WF	57.0	50.0	NC	12		Disc.	No	
1,950	27.0	40	86	Prim.	48.0	23.0	NC	118	32	Succ.	No	P (Exp. UL)
1,950	27.0	40		Prim.	55.0	30.0	HF	144	108	Succ.	Yes	P (Exp. UL)
1,950-2,100	22.0	20	150	Prim.	45.0		HF	1,000	400	Succ.	Yes	FW
7,400	26.0	92	248	Prim.			NC	200	200	Succ.		
3,000	42.0	0.8	147	Prim.			NC	700	700	Succ.		
820	39.0	7		Prim.			JS	92	83	TETT	No	P (Exp. L)
4,500	33.0	0.4	115	WF	35.0			400	400			
	20-25.0	66-90		Prim.	60.0		JS	150	150	Prom.		P (Exp. L)
3,000	19.0	32	120	Prim.	57.0	45.0	HF	100	100	Prom.		
1,200-1,600	16-18.0	150		Prim.	58.0	18.0	JS	300	300	Prom.		P (Exp. L)
1,000-1,200	11.5	5,000			75.0	20.0	JS	650	650	Prom.		FW
1,000-1,300	15.7	148		Prim.	70.0	20.0	HF	1,650	1,650	Succ.	Yes	FW
3,350	18.0	12.5	152	WF	90.0	65.0	NC	2,600	2,600	Succ.	Yes	FW
3,150	15.0	38	150	Prim.	90.0	67.0	HF	500	460	Prom.	Yes	FW
3,430	21.0	5.5	154		90.0	63.0	NC	2,200	2,200	Succ.	Yes	FW
3,300	20.0	5	149		90.0	50.0	HF	3,000	3,000	Succ.	Yes	FW
5,200	21.0	4.9	146	Prim.	84.0	69.0	HF	1,200	1,200	Prom.	Yes	FW
5,150	20.5	4.9	146	Prim.	90.0	72.0	HF			Succ.	Yes	FW
3,400	9.8	232		Prim.	78.8		HF	1,358	980	Prom.	Yes	P (Exp. L)
4,300	11.5	800	130	Prim.	70.0	63.0	HF	4,900	2,500	Prom.	Yes	P (Exp. UL)
2,650	9.3	376		Prim.	88.0		HF	11,047	6,700	Prom.	Yes	P (Exp. L)
2,850	10.0	370		Prim.			JS	600	450	TETT	Yes	P (Exp. L)
	9.2	351		Prim.	83.0		HF	46,400	28,000	Succ.	Yes	P
3,150	10.0	1,617	140	Prim.	80.0	72.0	HF	1,390	800	Prom.	Yes	FW
2,800	8.5	5,500		Prim.	80.0		JS	33,120	8,050	Succ.	Yes	
3,600	8.5	1,800		Prim.	82.0		NC	4,000	4,000	Succ.	Yes	P (Exp. UL)
	12.6	80		Prim.	80.0		JS	2,500	180	Succ.	Yes	FW
4,025	8.5	1,850		Prim.	75.0		JS	3,500	3,500	Succ.	Yes	P (Exp. L)
3,600	8.5	1,850		Prim.	85.0		JS	27,100	1,430	Succ.	Yes	FW
3,200	9.5	1,850		Prim.	82.2		JS	4,350	450	Succ.	Yes	FW
3,400	14.0	185		Prim.	85.0		JS	10		TETT	No	P (Exp. L)
2,690	12.0	600		Prim.	84.0		HF	12,429	6,428	Succ.	Yes	FW
1,700	11.9	2,000	111	Prim.	92.7	74.5	HF	1,100	850	Prom.	Yes	
2,100	11.4	3,500	117	Prim.	96.9	58.7	NC	3,900	1,370	Succ.	Yes	
1,500	12.2	1,000	108	Prim.	92.6	72.3	HF	1,800	550	Prom.	Yes	
850	10.5	10,000	95	Prim.	99.9	84.6	HF	1,600	1,600	Prom.	Yes	
2,615	15.0	580	126	Prim.	83.3	68.8	HF	12,980	6,000	Prom.	Yes	
1,250	12.0	3,000	104	Prim.	95.6	78.6	HF	1,400	950	Prom.	Yes	
1,750	13.1	750	113		86.0	74.0	NC	1,900	592	Prom.	Yes	
1,000	11.6	4,000	104	Prim.	94.6	79.6	HF	6,300	5,000	Prom.	Yes	
1,250	10.2	12,000	102	Prim.	99.9	89.9	HF	5,800	5,800	Prom.	Yes	
1,750	11.8	2500-11500	115		97.3	89.4	HF	20,000	10,680	Prom.	Yes	
1,220	13.1	6,000	123	Prim.	94.3	80.8	HF	3,500	2,200	Prom.	Yes	
1,400	11.8	1,000	110	Prim.	91.1	76.0	HF	5,400	3,300	Prom.	Yes	
1,250	13.1	1,000	113	Prim.	88.0	68.0		3,100	2,000	Prom.	Yes	
1,746	13.1	4,100	110	Prim.	95.1	80.9	HF	12,600	10,000	Prom.	Yes	
2,500	15.2	500-4500	122	Prim.	86.0	74.3	HF	6,190	2,460	Prom.	Yes	
1,590	12.0	1,000	111		81.0	56.0	HF	20,000	18,000	Succ.	Yes	
2,000	13.0	300-800	117	Prim.	85.0		JS	93,000	41,600	Prom.	Yes	
1,000	9.5	12,000	105	Prim.	100.0	76.9	NC	130	130	Prom.	Yes	
2,100	11.4	3,500	117	Prim.	9.0	7.0	NC	4,100	760	Succ.	Yes	
1,250	13.1	1,300	104	Prim.	92.0	78.0	NC	300	60	Prom.	Yes	
2,398	11.0	2000-3700	125	Prim.	90.6	77.9	HF	38,000	12,870	Prom.	Yes	
1,725	11.4	4000-9000	118	Prim.	97.8		HF	10,600	5,200	Prom.	Yes	
1,200	12.0	500	104		93.6	82.5	HF	6,400	5,100	Prom.	Yes	
1,250	11.7	7,500	106	Prim.	97.5	82.5	HF	7,500	6,200	Prom.	Yes	
2,600	15.2	250	125	Prim.	73.7	63.5	NC	270	220	Succ.	Yes	
2,300	24.5	175	95	WF	72.0	54.0	NC	155	155	Succ.	Yes	
2,550	24.5	175	95	WF	73.0	58.0	NC	135	135	Succ.	Yes	
2,300	24.5	175	95	WF	66.0	55.0	HF	180	150	Succ.	Yes	
2,460	25.0	175		WF	76.0	68.0	JS	65	47	TETT	TETT	P (Exp. L)
2,460	24.5	175	95	WF	70.0	68.0	NC	40	30	Disc.	No	
2,550	24.5	175	95	WF	72.0	68.0	NC	250	230	Succ.	Yes	
2,400	24.5	175	95	WF	70.0	56.0	HF	90	90	Succ.	Yes	
4,900	27.0	13	136	WF	69.0	43.0	NC	1,000	700	Succ.	Yes	
4,900	28.0	13	136	WF	72.0	42.0	NC	1,700	1,300	Succ.	Yes	
1,200	36.0	8	73	WF	53.0	37.0	NC	20	12	Succ.	No	P (Exp. L)
4,100	34.0	11	130	WF	39.0	33.0	JS	150	40	Prom.	TETT	
4,960	25.0	17	136	WF	60.0	45.0	HF	540	400	Prom.	Yes	
1,700-2,100	25.0	120		Prim.	78.0		JS	2,100	1,500	TETT	TETT	FW
2,130-2,790	27.0	120	95	Prim.			HF	1,160	1,000	Succ.	Yes	
2,130-2,790	27.0	120	95	Prim.			HF	1,260	900	Succ.	Yes	
2,070-2,460	25.0	120	96	Prim.			HF	1,400	1,100	Succ.	Yes	
2,650	25.0	175	100	Edge water drive	51.0	42.0	HF	1,370	1,300	Succ.	Yes	
2,400	24.5	175	95	Hot water flood	62.0	45.0	NC	1,670	1,660	Succ.	Yes	
4,900	27.0	11	136	WF	58.0	40.0	HF	100	30	TETT	TETT	

Producing thermal EOR in U.S.

Operator	Field	State	County	Start date	Area, acres	Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Steam											
ARCO	Midway-Sunset	Calif.	Kern	12-84	1.5	3	1	Fairfield Tar Sand	S	32.0	3,030
ARCO	Midway-Sunset	Calif.	Kern	1-72	7.8	22	2	Potter	S	32.0	1,675
ARCO	Midway-Sunset	Calif.	Kern	2-72	3.1	49	5	Potter	S	32.0	2,500
ARCO	Midway-Sunset	Calif.	Kern	8-72	3.2	11	1	Reef Ridge	S	32.0	1,000
Amoco	Winkleman Dome	Wyo.	Fremont	1964	160	21	15	Nugget	S	22.8	481
Angus Petroleum	Kern River	Calif.	Kern	9-83	85	35	35	Kern River	S	31.0	2,000
Celeron Oil & Gas	South Belridge	Calif.	Kern		90	41	30	Tulare	S	38.0	4,000
Celeron Oil & Gas	Midway-Sunset	Calif.	Kern		15	10	10	Monarch Sand	S	30.0	2,500
Chevron	Cymric	Calif.	Kern	5-66	26	18	0	Tar	S	32.0	1,200
Chevron	Cymric 36W	Calif.	Kern	5-75	110	98	47	Tulare/Amnicola	S	33.0	1,800
Chevron	Cymric 62Z	Calif.	Kern	2-86	30	31	19	Tulare	S	33.0	2,900
Chevron	Cymric Sec. 31X	Calif.	Kern	4-79	69	38	17	Amnicola	S	35.0	2,700
Chevron	Edison 27-RT	Calif.	Kern	7-77	30	65	29	Kern River	S	30.0	
Chevron	Fruitvale	Calif.	Kern	5-77	860	142		Chanac	S	29.0	920
Chevron	Kern Bluff	Calif.	Kern	7-66	214	25		Santa Margarita	S	29.0	2,000
Chevron	Kern River KCL 39	Calif.	Kern	10-75	118	67	42	Kern River	S	33.0	
Chevron	Kern River MC1	Calif.	Kern	4-76	132	120	76	Kern River	S	34.0	2,800
Chevron	Kern River MCII	Calif.	Kern	4-71	80	129	30	Kern River	S	34.0	2,800
Chevron	Kern River Sec. 3	Calif.	Kern	3-68	424	345	155	Kern River	S	34.0	3,389
Chevron	Kern River Sec. 4	Calif.	Kern	6-78	156	200	64	Kern River	S	34.0	
Chevron	Kern River AND	Calif.	Kern	5-74	160	177	82	Kern River	S	32.0	
Chevron	Lost Hills Sec. 18	Calif.	Kern	8-85	14	8	0	Tulare	S	38.0	2,000
Chevron	Lost Hills Sec. 18	Calif.	Kern	7-83	38	39	11	Tulare	S	38.0	2,100
Chevron	Lost Hills Sec. 30	Calif.	Kern	1-80	190	37	0	Etchegoin A	S	40.0	800
Chevron	Lost Hills Sec. 32	Calif.	Kern	3-85	16	11	4	Etchegoin A	S	40.0	2,500
Chevron	Lost Hills Sec. 32	Calif.	Kern	2-79	150	29		Etchegoin A	S	36.0	
Chevron	McKittrick 6Z	Calif.		4-85	30	29	18	Tulare/Amnicola	S	36.0	2,900
Chevron	McKittrick 9Z	Calif.	Kern	8-78	80	27	11	Amnicola	S	38.0	2,700
Chevron	Midway-Sunset Sec. 15A	Calif.	Kern	5-78	23	36	5	Potter	S	36.0	3,900
Chevron	Midway-Sunset Sec. 25A	Calif.	Kern	6-87	35	3	2	Tulare	S	35.0	1,000
Chevron	Midway-Sunset Sec. 26C	Calif.	Kern	11-75	84	243	81	Monarch	S	32.0	1,100
Chevron	Midway-Sunset Sec. 2F	Calif.	Kern	10-83		44	10				
Chevron	Midway-Sunset Sec. 1F	Calif.	Kern	2-78	19	23	8	Upper 10-10	S	32.0	2,200
Chevron	N. E. McKittrick 16-Z	Calif.	Kern	9-75	87	42	27	Amnicola	S	35.0	2,700
Chevron	Tejon Grapevine	Calif.	Kern	12-78	40	8		Basal Chanac		30.0	2,160
Chevron	West Coalinga 13-D	Calif.	Fresno	5-73	550	163	93	Temblor	S	35.0	1,000
Chevron	West Coalinga 25-D	Calif.	Kern	5-80	36	131	95	Chanac	S	29.0	1,000
Chevron	Yorba Linda	Calif.	Kern	7-62	80	76	0	Shallow Tar	S	27.0	1,000
Chevron	Kingdom Abo	Tex.	Terry	5-85	2,240	59	48	Abo Reef	Dolo	4.5	8
DCR Petroleum	Camp Hill	Tex.	Andersun	7-86	7.25	11	4	Carrizo	S	37.0	2,500
Exxon	Edison	Calif.	Kern	1965	1,100			Kern River	S	28.0	1,100
Lawrence Allison	Teapot Dome NPR-3	Wyo.	Natrona	10-85	20	22	4	Shannon	S	18.0	63
M. H. Whittier	Midway-Sunset	Calif.	Kern	1965	200	340		Potter	US	35.0	2,500
Marathon Oil	Garland	Wyo.	Big Horn	5-86	35	6	1	Madison	LS	15.5	10.4
Mobil	Cymric McKittrick Fee	Calif.	Kern	7-65	180	40	0	Welport Amnicola	S	35.0	3,000
Mobil	Edison	Calif.	Kern	12-81	100	11	0	Kern River	S	30.0	1,000
Mobil	Kern Front	Calif.	Kern	5-74	480	43	0	Etchegoin	S	37.0	1,000
Mobil	Midway-Sunset	Calif.	Kern	10-70	400	104	0	Monarch	S	34.0	4,000
Mobil	North Midway-Sunset	Calif.	Kern	11-67	410	300		Potter	S	35.0	1,000
Mobil	San Ardo	Calif.	Monterey	6-68	230	80	15	Aurignac	S	34.5	3,000
Mobil	San Ardo	Calif.	Monterey	3-80	63	31	9	Lombardi	S	32.5	3,000
Mobil	South Belridge	Calif.	Kern	1965	1,600	42		Tulare	S	35.0	3,000
Mobil	South Belridge	Calif.	Kern	1969	900	370	135	Tulare	S	35.0	3,000
Mobil	Saratoga	Tex.	Hardin	6-87	54	10	5	Miocene	S	35.0	3000
Oxy USA	Kern Front	Calif.	Kern	11-81	342	120	8	Etchegoin Chanac	S	33.0	3,250
Phillips	Smackover	Ark.	Ouachita	10-71	985	91	5	Nacatoch	S	35.0	2,000
Santa Fe Energy	Coalinga	Calif.	Fresno	3-79	280	250	60	Lower Temblor	S	30.0	100-3,000
Santa Fe Energy	Kern River	Calif.	Kern	1-80	180	143	68	Kern River	S	30.0	100-3,000
Santa Fe Energy	Midway	Calif.	Kern	1964	1,000	1,000		Potter Cyc	S	30.0	2,500
Santa Fe Energy	Midway	Calif.	Kern	1970	400	450		Spellacy	S	30.0	2,250
Santa Fe Energy	Midway	Calif.	Kern	6-82	800	200		Tulare	S	33.0	1,300
Santa Fe Energy	Midway	Calif.	Kern	1-85	100	160	25	Potter S.D.	S	30.0	2,500
Shell	Arroyo Grande	Calif.		1-87	45	16	25	M6	S	31.0	
Shell	Belridge	Calif.	Kern	1961	2,880	4,350	984	Tulare	S	36.0	2,400
Shell	Brea Olinda	Calif.	Orange	6-85	19	20	2	Middle A Sand	S	20.0	200
Shell	Cat Canyon	Calif.	Santa Barbara	3-85	1,000	50	0	Basal Sisquoc	S	32.0	750
Shell	Coalinga	Calif.	Fresno	1981	300	150	12	Temblor Zone II	S	30.0	
Shell	Coalinga	Calif.	Kern	1980	300	199	39	Temblor Zone I	S		30
Shell	Coalinga	Calif.	Fresno	1984	300	60	1	Temblor Zone II	S	27.0	
Shell	Coalinga	Calif.		11-87	223	57	17	Etchegoin	S	34.0	
Shell	Cymric	Calif.	Kern	10-85	185	27	24	Tulare	S	36.0	
Shell	Kern River	Calif.	Kern	1970	600	550	220	Kern River Series	S	30.0	
Shell	McKittrick	Calif.	Kern	11-85	226	40	26	Tulare	S	36.0	
Shell	Midway-Sunset	Calif.	Kern	1971	375	637	50	Potter	S	30.0	
Shell	Midway-Sunset	Calif.	Kern	1980	85	146	13	Monarch	S	25.0	
Shell	Midway-Sunset	Calif.		1981	95	60	0	Upper Spellacy	S	28.0	
Shell	Midway-Sunset	Calif.	Kern	1983	143	182	24	Sub-Hoyt	S	31.0	
Shell	Midway-Sunset	Calif.	Kern	6-86	110			San Joaquin	S	33.0	
Shell	Mount Poso	Calif.	Kern	1971	2,800	253	46	Vedder	S	33.0	
Shell	Poso Creek	Calif.	Kern	6-80	360	70	0	Etchegoin	S	33.0	
Shell	Yorba Linda	Calif.	Orange	1971	310	300	44	Upper Conglomerate	S	22.0	6,000
Shell	White Castle	La.	Iberville	8-76	64	42	13	V type	S	35.0	3,000
Shell	White Castle	La.	Iberville	8-76	31	42	13	U	S	35.0	3,000
Shell Western E&P	Cymric	Calif.	Kern	12-86	185	27	24	Tulare	S	36.0	2000
Shell Western E&P	McKittrick	Calif.	Kern	6-87	226	40	26	Tulare	S	36.0	2000
Sun	Cymric	Calif.	Kern	1981	135	57	0	Tulare	S	35.0	1,500
Sun	Midway-Sunset	Calif.	Kern	3-64	106	205	14	Potter-Tulare	S	35.0	3,000
Sun	Midway-Sunset	Calif.	Kern	8-65	40	249		Potter	S	35.0	3,000
Sun	Midway-Sunset	Calif.	Kern	1-84		95	6	Potter-Marvic-Tulare	S		
Sun	Midway-Sunset	Calif.	Kern	7-84		174	0	Potter	S		
Sun	Midway-Sunset Sec. 15	Calif.	Kern	5-64	80	106	0	Potter	S	35.0	3,000

Table E

Depth, ft	Reservoir oil: Gravity, API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project maturity[1]	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
1,050	14.0	1,500	95	Prim.			HF	20	15	Succ.	Yes	P (Exp. L)
1,200	12.0	2,000	100	Steam soak			HF	475	315	Succ.	Yes	P (Exp. L)
1,400	14.0	1,500	100	WF			NC	610	275	Succ.	Yes	FW
1,000	13.0	1,500	100	Steam soak			HF	110	83	Succ.	Yes	P (Exp. L)
1,225	14.0	1,000	81	Prim.	71.0		NC	400	400	Succ.		FW
1,200	12.0	5,000		Prim.	55.0		JS	300	300	Succ.	Yes	FW
1,250	13.0	450			63.0	49.0		2,000	2,000	Succ.	Yes	FW
1,500	12.0	11,000	95					600	600	Succ.	Yes	FW
700	11.0	6,500	81	Prim.	99.0		NC	332	273	Succ.	Yes	FW
1,200	13.0	4,000	100		52.0		NC	4,261	4,261	Succ.	Yes	FW
1,200	12.0	5,500	100	Cyclic	51.0	15.0	JS	1,850	1,650	Succ.	Yes	FW
1,300	12.0	3,000	100	Prim.	50.0		NC	1,033	1,033	Succ.	Yes	FW
1,000	14.0	2,000	90	Prim.	50.0		NC	1,868	1,868	Succ.	Yes	FW
3,300	19.0	78.0	131	Prim.	71.0		HF	1,168	920	Succ.	Yes	FW
950	15.0	1,000	84	Prim.	74.0		NC	58	58	Succ.	Yes	
1,400	14.0	2,000	90		65.0		HF	1,043	1,043	Succ.	Yes	FW
960	14.0	2,000	90		59.0		HF	3,235	3,155	Succ.	Yes	FW
960	14.0	2,000	90	Prim.	59.0		HF	2,121	2,121	Succ.	Yes	FW
775	14.0	2,000	90	Prim.	55.0		HF	9,718	9,475	Succ.	Yes	FW
850	14.0	2,000	90		60.0		HF	4,251	3,980	Succ.	Yes	FW
1,000	14.0	2,000	90	Prim.	55.0		HF	5,107	5,107	Succ.	Yes	FW
350	12.0	4,600	90	Cyclic	55.0	20.0	JS	19	9	Disc.	No	P (Exp. UL)
300	14.0	400	75	Cyclic	86.0		JS	708	708	Succ.	Yes	P (Exp. L)
550	18.0	300	90	Prim.			HF	534	478	Prom.		
850	14.0	1,400	100	Cyclic	50.0	20.0	JS	170	125	Succ.	Yes	FW
900-1,150	18.0	200	90	Prim.	72.0		HF	516	75	Succ.	Yes	
1,300	13.0	2,700	100	Cyclic	48.0	15.0		1,912		Prom.		
1,300	13.0	4,000	100	Cyclic	47.0		HF	580	580	Succ.	Yes	FW
1,400	14.0	900	120	Cyclic	61.0	20.0	NC	1,416	965	Succ.	Yes	P
1,000	11.0	10,000	90	Cyclic	53.0		JS	75	0	TETT		P
1,300	14.0	1,500	150	Cyclic	58.0	20.0	HF	8,195	7,638	Succ.	Yes	FW
								2,797				
1,600	14.0	1,500	105	Cyclic	55.0	15.0	NC	498	418	Succ.	Yes	FW
1,300	12.0	4,000	100	Cyclic	57.0		HF	634	634	Succ.	Yes	FW
2,600	16.0	167	115	Prim.				41		Disc.	No	
1,200	13.0	1,000	90	Prim.	46.0	15.0	NC	2,741	2,550	Succ.	Yes	FW
2,500	12.0	2,300	100	Prim.	50.0	12.0	HF	5,911	5,500	Succ.	Yes	FW
250-1,650	13.0	6,400	97	Prim.	95.0		NC	829	656	Succ.	Yes	FW
7,500	28.5	3.40	120	WF	58.0	40.0	JS	3,180	0	TETT		FW
400	18.4	1,200	75	Prim.	50.0		HF	150	150	Succ.	Yes	P (Exp. L)
1,100	12.0	8,000	95	Prim.	45.0	20.0	HF	525	525	Succ.	Yes	
250	33.0	10.0		Prim.	50.0	15.0	HF	350	300	Succ.	Yes	P (Exp. L)
1,000-1,500	13.0	2,200	100	Prim.	60.0	30.0	HF	5,900	5,900	Succ.	Yes	FW
4,250	22.0	29.0	140	Prim.			HF	419	81	TETT	No	P (Exp. L)
500	13.0	1,500	95	Prim.	87.5	57.7	NC	375	375	Succ.	Yes	FW
1,100	17.0	800	100	Prim.	87.0	33.0	JS	30	20	Succ.	Yes	FW
1,800	14.0	800	100	Prim.	86.0	67.0	NC	200	200	Succ.	Yes	FW
950	13.0	800	85	Prim.	64.0	53.0	HF	700	700	Succ.	Yes	FW
1,000	12.0	2,000	100	Prim.	65.0	30.0	HF	6,000	6,000	Succ.	Yes	FW
2,300	12.0	300	130	Steam soak	55.0	27.0	HF	1,900	1,900	Succ.	Yes	FW
2,100	11.0	2,000	125	Steam soak	55.0	27.0	HF	2,500	2,500	Succ.	Yes	P(Exp. L)
1,000	14.0	1,600	95	Prim.	64.0	60.0	NC	580	450	Succ.	Yes	FW
1,000	14.0	1,600	95	Prim.	60.0	35.0	HF	24,030	22,300	Succ.	Yes	FW
500	15.0	500	74	Prim.	50.0	20.0	JS	380	380	Prom.	Yes	FW
1,300-1,500	14.0	1,525	95	Prim.	50.0	15.0	HF	1,000	950	Succ.	Yes	FW
1,920	20.0	75.0	110	Prim.	71.0	50.0	NC	800	130	Succ.	Yes	FW
850-1,800	14.5	1,900	75	Prim.	35.0	15.0	JS	3,200	2,800	Succ.	Yes	FW
700	13.0	4,000	85	Prim.	45.0	15.0	NC	3,200	2,600	Succ.	Yes	
1,300	12.0	4,000	100	Prim.	60.0	33.0		17,000	15,000	Succ.	Yes	FW
900	11.5	6,500	90	Prim.	60.0	33.0		4,300	3,500	Succ.	Yes	FW
1,200	11.0	5,000	100	Prim.	50.0	43.0		1,800	1,400	Succ.	Yes	FW
1,300	12.0	4,000	100	Prim./cyclic	60.0	20.0		3,200	1,400	Succ.	Yes	FW
500-1,000	14.0	3,000		Prim.			JS	250	200	Prom.		FW
400-1,400	13.0	1,900	95	Prim.	75.0	20.0	HF	101,000	101,000	Succ.	Yes	FW
2,600	14.0	500	120	Steam soak	49.0		JS	320	280	Succ.	Yes	FW
4,400	10.8	2,896	130	Prim.	55.0		JS	1,500	500	TETT	Yes	FW
1,600	18.0	150	100	Steam soak			HF	2,500	2,200	Succ.	Yes	FW
1,000	13.0	6,000	110	Prim.			HF	3,400	3,200	Succ.	Yes	FW
1,800	18.0	150	100	Prim.			JS	900	720	Succ.	Yes	P (Exp. L)
950	10.6	10,000		Prim.			JS	380	380	Prom.		FW
1,400	13.0	2,000	100	Prim.			JS	1,700	1,400	Prom.	Yes	
300-1,500	13.0	6,000	85	Prim.			HF	12,000	11,436	Succ.	Yes	FW
500	12.0	10,000	100	None			JS	15	0	TETT	TETT	
1,200	11.0	8,000	95	Prim.			HF	13,000	13,000	Succ.	Yes	FW
1,300	13.0	5,000	95	Steam soak			HF	7,000	6,800	Succ.	Yes	FW
900	13.0	2,235	90	Prim.			JS	1,500	1,200	Succ.	Yes	FW
1,080	13.0	3,000	100	Prim.			JS	6,200	5,800	Succ.	Yes	FW
1,200	12.0	2,900	95	Prim.			JS	800	750	Prom.	Yes	FW
1,800	16.0	277	110	Prim.			NC	16,600	16,050	Succ.	Yes	FW
2,500	12.5	600	110	Prim.			JS	800	500	Succ.	Yes	FW
650	12.0	6,400	85	Steam soak	66.0		NC	2,800	2,800	Succ.	Yes	FW
1,400	16.0	312	92	Prim.			HF	2,300	2,300	Succ.	Yes	
1,100	16.0	145	88	Prim.			HF	250	250	Succ.	Yes	
1,000	13.0	1,800	105	Prim.			JS	1,700	1,400	Prom.		FW
600	11.0	15,300	100	Prim.			JS	15	0	TETT		FW
600-1,500	12.0		80	Prim.			HF	1,239	1,239	Succ.	Yes	FW
1,200	12.0			Prim.			HF	7,795	7,795	Succ.	Yes	FW
1,700	12.0			Prim.			HF	5,312	5,312	Succ.	Yes	FW
1,100	11.0			Prim.			JS	1,014	1,014	Succ.	Yes	FW
0				Prim.			JS	5,028	5,028	Succ.	Yes	FW
1,200	12.0			Prim.			HF	2,277	2,277	Succ.	Yes	FW

Producing thermal EOR in U.S. — continued

Operator	Field	State	County	Start date	Area, acres	Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Sun	Midway-Sunset	Calif	Kern	7-84		36	0	Potter	S		
Sun	Midway-Sunset	Calif	Kern	7-84		60	2	Potter	S		
Sun	Midway-Sunset	Calif	Kern	1-84		127	0	Potter	S		
Tenneco	Kern River	Calif	Kern	1972	50	41	20	Kern River Series	S	31.0	2,000
Tenneco	Kern River	Calif	Kern	1970	80	112	33	Kern River Series	S	31.0	2,000
Tenneco	Kern River	Calif	Kern	9-72	38	32	16	Kern River Series	S	31.0	2,500
Tenneco	Kern River	Calif	Kern	1970	95	72	36	Kern River Series	S	33.0	4,000
Tenneco	Midway-Sunset	Calif	Kern	1981	40	70	10	Monarch	S	30.0	3,000
Tenneco	Midway-Sunset	Calif	Kern	4-85	30	26	5	Potter	S	34.0	3,700
Tenneco	Midway-Sunset	Calif	Kern	1969	50	60	15	Metson	S	30.0	3,000
Tenneco	Midway-Sunset	Calif	Kern	1984	15	12	0	Sub Lakeview	S	30.0	4,500
Tenneco	Midway-Sunset	Calif	Kern	1983	34	13	2	L. Monarch	S	30.0	2,000
Tenneco	Midway-Sunset	Calif	Kern	4-84	25	24	2	Potter	S	34.0	4,000
Tenneco	Midway-Sunset	Calif	Kern	1985	22	17	5	U. Monarch	S	29.0	2,000
Tenneco	Midway-Sunset	Calif	Kern	3-73	24	27	2	Potter	S	34.0	4,100
Tenneco	Placerita	Calif	Los Angeles	1986	55	50	11	L. Kraft	S	28.0	3,000
Texaco	Cat Canyon	Calif	Santa Barbara	1964	1,700	30		S1B	S	31.0	3,000
Texaco	Cat Canyon	Calif	Santa Barbara	1977	390	80		S1A-S6	S	31.0	1,400
Texaco	Kern River	Calif	Kern	8-62	5,070	4,457	1,469	Kern [illegible] series	S	31.0	4,000
Texaco	Lost Hills	Calif	Kern	1977	49	23	16	Tulare	S	38.0	2,000
Texaco	Lost Hills	Calif	Kern	1977	35	46	11	Etchegoin	S	40.0	2,000
Texaco	McKittrick	Calif	Kern	1984	18	16	9	Tulare	S	35.0	2,800
Texaco	Midway-North Midway	Calif	Kern	11-81	40	61	16	Potter	S	30.0	3,400
Texaco	Midway-Reward	Calif	Kern	2-77	10	35	9	Potter	S	33.0	3,000
Texaco	Midway-Santiago Creek	Calif	Kern	12-83	10	10	4	Tulare	S	34.0	2,500
Texaco	Midway-Sec 35	Calif	Kern	1984	7.5	16	5	Potter	S	35.0	2,000
Texaco	Midway-Sec 35	Calif	Kern	1977	10	13	6	Potter	S	35.0	2,000
Texaco	Midway-Security	Calif	Kern	11-77	30	43	20	Potter	S	33.0	5,000
Texaco	San Ardo	Calif	Monterey	7-87	51	24	7	Lombardi	S	32.0	5500
Texaco	San Ardo	Calif	Monterey	1965	1,108	231	13	Aurignac	S	39.0	2,200
Texaco	Sour Lake	Tex	Hardin	3-85	8	12	4	Miocene OB-2	S	33.3	1,000
Texaco	Sour Lake	Tex	Hardin	11-81	19.8	24	12	Miocene OB-1	S	35.5	1,436
Texaco	Sour Lake	Tex	Hardin	6-84	7	8	4	Miocene OB-4	S	35.0	900
Union Pacific Resources	Wilmington	Calif	Los Angeles	7-82	20	9	4	Tar	S	30.1	2780
Unocal	Cymric	Calif	Kern	1964	300	179	0	Tulare	S	35.0	1,000
Unocal	Gato Ridge	Calif	Santa Barbara	1970	130	16	0	Sisquoc Sib & S2	S	32.0	2,500
Unocal	Guadalupe	Calif	San Luis	1955	2,970	114	0	Sisquoc	S	35.0	1,550
Unocal	McKittrick	Calif	Kern	8-83	17	21	8	Tulare	S	36.0	1000-2000
Unocal	McKittrick	Calif	Kern	6-77	131	37	15	Amnicola	S	37.0	1000-2000
Unocal	Midway-Sunset	Calif	Kern	1983	80.5	61	0	Tulare	US	31.0	1,146
Unocal	Midway-Sunset	Calif	Kern	6-77	39	48	18	Potter	S	24.0	1,500
Unocal	Midway-Sunset	Calif	Kern	1-85	5.2	9	4	Potter	US	34.5	3,700
Unocal	Midway-Sunset	Calif	Kern	1974	80.5	46	17	Potter	US	34.5	3,700
Unocal	Midway-Sunset	Calif	Kern	5-69	161	184	0	Potter	S	24.0	1,500
Unocal	North Belridge	Calif	Kern	11-65	160	12	0	Tulare	S	38.0	2,500
Unocal	South Belridge	Calif	Kern	3-85	167	12	0	Tulare	S	38.0	4,000
Unocal	Tensleep	Wyo	Natrona	5-81	18	5	2	Tensleep	S	18.0	500
Hot water											
ARCO	Midway-Sunset	Calif	Kern	8-85	6	6	2	Tulare	S	33.0	2,500
Mobil	South Belridge	Calif	Kern	11-82	246	58	22	Tulare	S	35.0	3,000
Tenneco	Kern River	Calif	Bakersfield	1986	50	45	10	Kern River Series	S	31.0	3,000
Tenneco	Kern River	Calif	Bakersfield	1986	28	42	11	Kern River Series	S	31.0	2,500
Texaco	Lost Hills	Calif	Kern	1-86	38	31	13	Etchegoin	S	40.0	2000
Texaco	Lost Hills	Calif	Kern	1-86	11	13	4	Tulare	S	38.0	2000
Texaco	McKittrick	Calif	Kern	1981	12	18	9	Potter	S	35.0	4,000
Texaco	Midway-Sec 35	Calif	Kern	3-87	10	16	6	Potter	S	35.0	2000
Texaco	San Ardo	Calif	Monterey	9-86	95	41	9	Aurignac	S	33.0	3000
Unocal	McKittrick	Calif	Kern	6-87	70	25	14	Amnicola	S	37.0	1,500
Combustion Projects											
Bayou State	Bellevue	La	Bossier	1970	180	82	15	Nacatoch	S	32.0	650
Chevron	W. Heidelberg Cotton Valley Unit	Miss	Jasper	12-71	362	9	3	Cotton Valley 4 & 5	S	14.0	85
Greenwich Oil	Forest Hill	Tex	Wood	9-76	1,900	100	21	Harris Sand	S	28.0	950
Mobil	Midway-Sunset	Calif	Kern	1-60	150	32	6	Moco	S	36.0	1,500
Mobil	Lost Hills	Calif	Kern	4-61	164	33	10	Tulare	S	42.6	1,790
Mobil	West Newport	Calif	Orange	1958	300	139	36	Miocene	S	37.0	500-1,000
Oxy USA	Bellevue	La	Bossier	1971	180	186	48	Nacatoch	S	33.9	700
Santa Fe Energy	Midway-Sunset	Calif	Kern	1982	24	40	10	Potter	S	32.5	200-4,000
Texaco	Bellevue	La	Bossier	9-63	385	183	28	Nacatoch	S	33.0	960

Producing CO_2, gas EOR in U.S.

Operator	Field	State	County	Start date	Area, acres	Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
CO_2 miscible											
ARCO	North Coles Levee	Calif	Kern	6-81	70	7	1	Stevens	S	19.5	9
ARCO	Sho-Vel-Tum	Okla	Stephens	9-82	1,100	69	41	Sims	S	16.0	70
ARCO	Sable	Tex	Yoakum	3-84	825	32	21	San Andres	Dolo	8.4	1.5
ARCO	Wasson-Willard	Tex	Yoakum	1-86	8,000	286	225	San Andres	Dolo	9.0	1.3
Amoco	Levelland	Tex	Hockley	8-78	15	1	4	San Andres	Dolo	11.8	3.8
Amoco	Levelland	Tex	Hockley	3-73	13.2	2	6	San Andres	Dolo	11.5	3.5

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project maturity†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
0				Prim.			JS	346	346	Succ.	Yes	FW
0				Prim.			JS	700	700	Succ.	Yes	FW
1,100	11.0			Prim.			JS	2,736	2,736	Succ.	Yes	FW
800	13.0	8,000	90	Steam soak	60.0	15.0	NC	1,600	1,500	Succ.	Yes	FW
600	13.0	5,000	78	Prim.	63.0	15.0	HF	1,100	1,100	Succ.	Yes	FW
900	13.0	7,000	84	Prim.	70.0	15.0	HF	650	650	Succ.	Yes	FW
1,200	13.0	8,000	90	Steam soak	55.0	20.0	NC	1,200	1,100	Succ.	Yes	FW
1,200	13.0	30.0	200	Steam soak	45.0	20.0	HF	1,300	700	Succ.	Yes	FW
1,500	11.5	10,000	95	Steam soak	62.0	15.0	JS	900	700	Succ.	Yes	FW
1,100	11.4	1,200	130	Prim.	75.0	57.0	NC	800	250	TETT	TETT	FW
1,300	13.0	4,000	90	Prim.	60.0	20.0	JS	120	100	Succ.	Yes	FW
1,500	12.0	5,000	86	Cyclic steam	60.0	30.0	JS	300	200	Succ.	Yes	FW
1,600	11.5	10,000	95	Steam soak	67.0	15.0	HF	700	500	Succ.	Yes	FW
1,300	12.5	5,000	86	Steam soak	60.0	30.0	JS	600	500	Prom.	Yes	FW
1,600	11.5	7,000	95	Steam soak	65.0	15.0	NC	900	850	Succ.	Yes	FW
1,800	12.0	7,500	100	Prim.	62.0	15.0	JS	420	420	TETT	TETT	FW
2,300	8.0	100,000	100	None			NC	200	200	Succ.	Yes	
2,500	7.0	50-100000	110	None			NC	2,800	2,800	Succ.	Yes	FW
1,000	13.0	4,060	90	Prim.	70.0	30.0	HF	87,600	87,600	Succ.	Yes	FW
200	13.0	20.0	220	Steam stimulation	70.0	30.0	NC	530	520	Succ.	Yes	FW
400	13.0	10.0	250	Steam stimulation	63.0	30.0	NC	950	900	Succ.	Yes	FW
1,000	13.0	35.0	220	Steam stimulation	60.0	30.0	HF	80	70	Disc.	No	P (Exp. UL)
1,000	13.0	1,500	90	Steam stimulation	60.0	20.0	HF	2,480	1,370	Succ.	Yes	FW
1,300	13.0	1,500	90	Steam stimulation	60.0	20.0	HF	1,125	900	Succ.	Yes	FW
1,300	12.0	1,500	90	Steam stimulation	60.0	20.0	HF	300	300	Prom.	Yes	P (Exp. L)
1,600	12.0	1,500	90	Steam soak	55.0		HF	650	450	Succ.	Yes	FW
1,600	12.0	6,500	90	Steam soak	55.0	20.0	NC	330	180	Succ.	Yes	P (Exp. L)
950	12.0	1,500	90	Steam stimulation	60.0	20.0	NC	2,040	800	Succ.	Yes	FW
1,900	11.0	1,200	135	Cyclic steam	58.0	15.0	JS	1,057	1,057	TETT	No	P (Exp. L)
2,200	13.0	4,500	100	Cyclic	58.0	24.0	NC	6,876	6,876	Succ.	Yes	FW
2,000	16.2	100	95	Prim.	50.0	20.0	NC	140	140	Succ.	Yes	FW
1,000	14.7	665	90	Prim.	53.0	17.0	NC	300	300	Succ.	Yes	P (Exp. L)
1,600	16.2	107	100	Prim.	50.0	20.0	NC	200	200	Succ.	Yes	FW
2,563	14.0	283	123	WF	55.0	20.0	HF	400	400	Succ.	Yes	P (Exp. L)
1,100	13.0			Prim.	65.0	45.0	NC	5,230	4,340	Succ.	Yes	FW
1,900	10.5	1,450	130	Prim.	65.0	49.0	HF	60	5	Disc.	No	FW
3,000	9.0	580	85	Prim.	80.0	60.0	HF	1,200	500	Succ.	Yes	FW
850	11.4	1,000	140	Steam soak	60.0	27.0	NC	650	545	Succ.	Yes	FW
1,100	11.3	500	170	Steam soak	60.0	36.0	NC	610	425	Succ.	Yes	FW
700	11.4	10,000	100	Prim.	54.0	37.8	HF	730	425	Succ.	Yes	FW
1,000	11.3	100	220	Steam soak	55.0	34.0	NC	2,200	1,960	Succ.	Yes	FW
1,100	11.4	10,000	110	Steam drive	52.0	28.0	NC	719	109	Succ.	Yes	P (Exp. L)
1,100	11.4	10,000	110	Steam soak	57.2	32.3	HF	2,780	2,550	Succ.	Yes	FW
1,000	11.3	500	170	Prim.	57.0	35.0	NC	3,600	2,680	Succ.	Yes	FW
800	13.6	450	130	Prim.	63.0	49.0	HF	108	0	Disc.	No	FW
1,250	13.2	450	130	Prim.	66.0	52.0	JS	103	0	Disc.	No	FW
2,500	14.0	580	90	Prim.	67.0	30.0	HF	370	270	Prom.	No	P
1,000	11.0	24,000	100	Steam flood			HF	54	11	Succ.	Yes	P (Exp. UL)
1,000	14.0	1,600	95	Steam flood	40.0	30.0	JS	2,250	2,080	TETT	Yes	P
900	13.5	8,000	90	Steam drive	30.0	20.0	JS	250	150	Succ.	Yes	FW
600	13.5	5,000	78	Steam drive	35.0	20.0	JS	200	50	TETT	Yes	FW
400	13.0	10.0	250	Steam flood			JS	110	100	TETT	Yes	P (Exp. L)
200	13.0	20.0	250	Steam flood			JS	170	165	Succ.	Yes	P (Exp. L)
1,100	13.0	40.0	210	Steam flood	50.0	30.0	HF	90	20	Disc.	No	P (Exp. UL)
1,600	12.0	38.0	200	Steam flood			JS	400	220	TETT	Yes	P (Exp. L)
2,200	13.0	4,000	100	Steam drive	38.0	31.0	JS	570	100	TETT	Yes	P (Exp. L)
1,100	12.0	30.0		Steam drive	41.0	31.0	JS	290	0	TETT		FW
400	19.0	660		Prim.	94.0	49.0	HF	400	400	Succ.	Yes	FW
11,300	18-27.0	6.00	221	Prim.	80.0		NC	565	565	Succ.	Yes	FW
5,000	10.0	1,006	185	Prim.	63.0	32.0	JS	1,050	1,050	Prom.	No	FW
2,700	14.0	110	125		74.0	37.0	HF	790	790	Succ.	Yes	FW
300	15.0	410	95	Prim.	63.0	22.0	NC	520	520	Succ.	Yes	FW
1,600	13.0	750	100	Prim.	86.0	37.0	HF	1,100	1,100	Succ.	Yes	FW
300-400	19.0	676	75	Prim.	72.0	32.0	NC	300	300	Succ.	Yes	FW
1,700	11.5	2,770	110	Prim.:drive:cyclic	70.0	10.0	JS	1,000	800	Prom.	TETT	
350	19.0	675	130	Prim.	60.0	28.5	NC	1,000	1,000	Succ.	Yes	FW

Table F

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
9,000	36.0	0.45	235	Prim.	34.0	25.8	HF	80		Disc.	No	P (Exp. UL)
6,200	25.0	3.30	115	WF	59.0	42.0	HF	2,200	1,100	Succ.	Yes	FW
5,200	32.0	1.46	107	WF			JS	685	100	Prom.	Yes	FW
5,100	32.0	2.01	110	WF			JS	4,393	0	TETT		FW
4,900	30.0	2.30	105	WF	43.0		HF	5	5	Succ.		P (Exp. L)
4,900	30.0	2.30	105	WF	74.0		HF	38	38	Succ.		P (Exp. L)

Producing CO_2, gas EOR in U.S, — continued

Operator	Field	State	County	Start date	Area, acres	Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Amoco	North Cowden Unit	Tex.	Ector	6/85	12	2	6	Grayburg	Dolo./LS	10.0	5.4
Amoco	Slaughter	Tex.	Hockley	1984	6,412	229	71	San Andres	Dolo./LS	10.0	9
Amoco	Slaughter	Tex.	Hockley	12/84	1,600	72	50	San Andres	Dolo./LS	10.0	4
Amoco	Slaughter	Tex.	Hockley	12/84	5,700	215	127	San Andres	Dolo./LS	13.0	7
Amoco	Wasson	Tex.	Yoakum	12/84	7,800	321	282	San Andres	Dolo./LS	9.0	5
Amoco	Wertz	Wyo.	Carbon, Sweetwater	10/86	1,400			Tensleep	S	10.0	20
Chevron	Rangely Weber Sand	Colo.	Rio Blanco	10/86	15,000	234	70	Weber SS	S	12.0	5-50
Chevron	Quarantine Bay	La.	Plaquemines	10/81	57	2	1	4 Sand Reservoir	S	30.0	100-1,000
Chevron	Timbalier Bay	La.	Lafourche	4/84	37	2	1	S-2B	S	30.0	9,244
Chevron	Kurten	Tex.	Brazos	8/81	672	5	4	Woodbine	S	12.0	0.4
Chevron	Pittsburg	Tex.	Camp	6/85	43	4	1	Pittsburg	Limey Sand	11.0	2.4
Chevron	SACROC Unit	Tex.	Scurry	1/72	49,900	732	387	Canyon Reef	LS	3.9	19.4
Conoco	Ford Geraldine Unit	Tex.	Reeves & Culberson	2/81	3,850	86	60	Delaware	S	23.0	64
Enron Oil & Gas	Twofreds	Tex.	Loving, Ward & Reeves	1/74	4,392	42	33	Delaware	S	19.5	32
Exxon	Cordona Lake	Tex.	Crane	12/85	3,516	33	13	Devonian	Dolo.	22.0	3.5
Exxon	Means (San Andres)	Tex.	Andrews	11/83	6,700	368	214	San Andres	LS	9.0	20
Exxon	Slaughter	Tex.	Hockley	5/85	569	20	11	San Andres	Dolo.	12.5	6.3
Exxon	Wasson (Cornell Unit)	Tex.	Yoakum	7/85	1,923	62	38	San Andres	Dolo.	8.6	1.9
George R. Brown Prtshp.	Rose City South	Tex.	Orange	1/83	900	8	2	Hackberry	S	37.0	4,500
George R. Brown Prtshp.	Rose City North	Tex.	Orange	4/81	800	8	5	Hackberry	S	37.0	4,500
Mitchell Energy	Alvord South	Tex.	Wise	1980	2,291	17	3	Caddo	Congl.	12.8	55
Mobil	GMK South	Tex.	Gaines	1982	1,143	26	27	San Andres	LS	9.8	3.1
Mobil	McElmo Creek Unit	Utah	San Juan	2/85	13,440	170	100	Ismay Desert Creek	LS	14.0	5
Mobil	Wasson	Tex.	Yoakum	10/85	640	29	14	San Andres	Dolo.	13.0	6.2
Oxy USA	Welch	Tex.	Dawson	2/82	2,675	140	119	San Andres	LS	9.3	9
Oxy USA	Northeast Purdy	Okla.	Garvin	9/82	8,320	106	102	Springer	S	13.0	44
Pennzoil	Richardson	W.V.	Calhoun, Roane	8/86	78	8	4	Berea	S	14.0	40
Pennzoil	Tinsley	Miss.	Yazoo	11/81	1,338	15	15	Perry	S	26.4	49
Phillips	E. Vacuum	N.M.	Lea	2/81	4,900	192	100	San Andres	Dolo.	11.7	11
Santa Fe Energy	Raymond	Mont.	Sheridan	8/83	685	2	1	Nisku	LS	8.2	13
Shell Offshore	West Mallalieu	Miss.	Lincoln	11/86	5,760	9	9	Lower Tuscaloosa	S	25.0	20
Shell Offshore	Olive	Miss.	Pike	10/87	1,280	16	6	Lower Tuscaloosa	S	26.0	50
Shell Western E&P	Crossett (N. Cross)	Tex.	Crane & Upton	4/72	1,500	23	11	Devonian	Tripol. chert	22.0	5
Shell Western E&P	Little Creek	Miss.	Lincoln & Pike	12/85	6,200	55	20	Lower Tuscaloosa	S	23.0	33
Shell Western E&P	Wasson	Tex.	Yoakum	4/83	20,000	1,195	805	San Andres	Dolo.	12.0	8
Shell Western E&P	Wasson	Tex.	Gaines	1/86	3,500	110	43	Clearfork	Dolo.	6.0	3
Stanberry Oil	Hansford Marmaton	Tex.	Hansford	6/80	2,010	9	10	Marmaton	S	16.5	52
Stanberry Oil	Farnsworth, North	Tex.	Ochiltree	6/80	1,431	9	5	Marmaton B	LS	11.5	140
Texaco	Paradis	La.	St. Charles	2/82	347	7	4	Lower 9000-Foot	S	26.0	770
Texaco	Paradis	La.	St. Charles	2/82	320	4	3	No. 8	S	27.0	795
Texaco	Bay St. Elaine	La.	Terrebonne	1/81	9	2	1	8000-Foot	S	32.9	1,480
Union Texas Petroleum	Wellman	Tex.	Terry	7/83	1,400	32	7	Wolfcamp	LS	9.2	>100
Unocal	Dollarhide	Tex.	Andrews	5/85	6,183	83	66	Devonian	Dolo./Tripol.	13.5	9
CO_2 immiscible											
Chevron	Pittsburg	Tex.	Camp	11/83	40	1	0	Sub-Clarksville	S	23.0	460
Chevron	Heidelberg	Miss.	Jasper	12/83	40	1	0	Eutaw	S	25.0	74
Chevron	Timbalier Bay	La.	Lafourche	12/85	422	10		4900 Foot Sand	S	32.0	500-2,500
Exxon	Pewitt Ranch	Tex.	Titus	6/83		1		Paluxy	S	24.0	1000-1500
Marathon Oil	Yates	Tex.	Pecos & Crockett	11/85	14,300	958	27	Grayburg/San Andres	Dolo.	17.0	175
Shell Western E&P	Weeks Island	La.	New Iberia	1978	8	2	1	S RES B	S	26.0	1,800
Union Pacific Resources	Wilmington	Calif.	Los Angeles	3/81	41	3	4	Tar	S	24.0	465
Union Pacific Resources	Wilmington	Calif.	Los Angeles	2/84	156	10	12	Tar	S	24.0	465
Hydrocarbon miscible											
ARCO	Prudhoe Bay	Alaska	Prudhoe Bay	12/82	3,650	42	11	Sadlerochit	S	23.0	300
ARCO	Chandeleur Sound Block 25	La.	St. Bernard	1/83	342	11	3	4800 ft. Sand	S	21.3	1,980
ARCO	Chandeleur Sound Block 25	La.	St. Bernard	1/83	941	48	17	BB	S	33.0	1,680
ARCO	South Pass Block 61	OCS		8/83	26	1	1	LL RG	S	33.0	10
ARCO	South Pass Block 61	OCS		8/83	55	1	1	I RK2	S	30.0	25
ARCO	South Pass Block 61	OCS		5/81	54	4	2	MM RBB	S	30.0	300
ARCO	South Pass Block 61	OCS		5/81	112	5	2	UM RBB	S	30.0	300
ARCO	South Pass Block 61	OCS		5/81	320	6	3	UM RAAO, 2, 3	S	30.0	180
ARCO	South Pass Block 61	OCS		8/83	39	2	1	UJ RL	S	33.0	50
ARCO	South Pass Block 61	OCS		8/85	54	2	1	LL RBB1, 2	S	30.0	175
ARCO	South Pass Block 61	OCS		5/81	179	5	3	MM RAAO, 2, 3	S	30.0	180
ARCO	South Pass Block 61	OCS		2/84	37	2	1	LL ART	S	30.0	50
ARCO	South Pass Block 61	OCS		10/84	68	3	3	LK2 RU	S	29.0	100
ARCO Alaska/Standard Alaska	Prudhoe Bay	Alaska		2/87	13,500	157	43	Sadlerochit	S	22.0	500
Amoco	Levelland	Tex.	Hockley	5/71	1,200	40	28	San Andres	Dolo.	10.2	2.1
Exxon	South Pass Block 89	Tex.	Gulf of Mexico	12/83		12	9	X and Y Series	S	31.0	10-1,500
Hunt	Fairway	Tex.	Anderson/Henderson	3/66	22,618	118	64	James	LS	12.6	11
Phillips	Bridger Lake	Utah	Summit	4/70	3,800	7	1	Dakota	S	12.8	79
Sun E&P	Fordoche W-12	La.	Pt. Coupee	5/80	3,400	5	5	Wilcox	S	19.0	4.6
Sun E&P	Fordoche W-8	La.	Pt. Coupee	5/80	3,300	8	3	Wilcox	S	20.0	8.6

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project status[1]	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
4,300	34.0	1.67	94	WF			JS	20	20	Succ.		P
4,900	31.0	1.40	105	WF			JS	4,400	1,200	Prom.	Yes	FW
4,950	31.0	1.40	105	WF			JS	2,715	400	Succ.	Yes	FW
4,950	31.0	1.40	105	WF			JS	8,311	1,500	Succ.	Yes	FW
5,100	32.0	1.30	110	WF			JS	15,438	3,500	Succ.	Yes	FW
6,000	35.0	1.116	163	WF			JS	10,000	6,600	Prom.	Yes	FW
5,500-6,500	35.0	1.70	160	Prim./WF	38.0	29.0	JS	32,650	4,500	Prom.		FW
8,120	32.0	0.99	183	Prim.	55.0	15.0	HF			Prom.	No	
7,400	39.0	0.39	180	Prim.	29.0		HF	0	0	TETT	No	P (Exp. L)
8,300	38.0	0.40	230	Prim.	40.0		JS	182	156	Prom.		P
8,000	41.0		205	WF	59.0		NC	130	36	Prom.	Yes	P (Exp. L)
6,700	41.0	0.35	130	Prim./WF	63.3	46.8	NC	32,416	17,634	Succ.	Yes	FW
2,680	40.0	1.40	83	Prim./WF			JS	1,150	1,150	Succ.	No	FW
4,900	36.0	1.50	105	WF			NC	700	700	Succ.	Yes	FW
3,200	40.0	0.50	101	WF			JS			TETT	TETT	
4,300	29.0	6.00	97	WF			JS			TETT	TETT	
4,900	32.0	1.30	110	WF			JS			TETT	TETT	
4,500	33.0	1.00	106	WF			JS			TETT	TETT	
8,200	37.0	2.00	180	WF	50.0	35.0	HF	811	600	Prom.		FW
8,200	37.0	2.00	180	WF	50.0	35.0	HF	160	160	Prom.		FW
5,700	44.0	0.39	154	WF	60.0	52.0	HF	490	215	Prom.	No	FW
5,400	30.0	2.57	101	WF	55.0	28.0	JS	2,000	200	Prom.	Yes	LW
5,600	41.0	0.50	125	Prim./WF	50.0		JS	5,300	900	Prom.	Yes	FW
5,100	33.0	0.97	110	WF	54.4	39.2	JS	1,654	150		Yes	FW
4,890	34.0	2.15	96	WF	30.0	18.0	HF	1,940	155	TETT	TETT	FW
9,400	38.0	1.20	148	WF	46.0	40.0	NC	3,500	1,800	Succ.	TETT	FW
2,300	46.0	3.00	80	WF	48.0		JS	80	40	Prom.	No	P
4,800	39.0	1,50	175	WF	65.0	38.0	HF	300	300	Prom.	No	FW
4,500	38.0	1.00	101	Prim.	70.0	50.0	JS	9,500		Succ.	Yes	FW
7,900	40.0	0.40	178	Prim.			JS	90	50	Prom.	Yes	
10,365	38.0	0.50		Prim.	15.0	1.0	JS	400	400	TETT	TETT	FW
10,500	39.0	0.34		WF	17.0	2.0	JS			TETT	TETT	FW
5,300	44.0	0.36	106	Residue gas inj.	34.0	22.0	HF	1,925	1,925	Succ.	Yes	FW
10,640	38.0	0.40	248	WF	21.0	2.0	JS	3,500	3,500	Prom.	TETT	
5,200	33.0	1.30	105	WF	40.0	27.0	JS	43,600	11,000	Succ.	Yes	FW
6,700	33.0	1.20	105	WF	60.0		JS	6,200	0	Prom.		FW
6,500	44.0	1.56	135	Prim.	43.0		HF	553	553	Succ.	Yes	FW
6,400	44.0	1.61	135	WF	57.0		HF	470	470	Succ.	Yes	FW
10,400	37.0	0.50	205	Prim.	62.0	48.0	HF	400	400	Prom.	No	PW
8,600	39.0	0.40	192	Prim.	30.0	20.0	NC	125	125	Prom.	No	RW
7,400	36.0	0.67	170	Prim.	20.0	5.0	NC	10	10	Disc.	No	RW
9,800	43.5	0.54	151	WF	35.0	10.0	JS	3,600	400	TETT	TETT	FW
8,000	40.0	0.44	122	Prim./WF	35.0	22.0	JS	3,000	2,200	TETT	TETT	FW
3,800	14.0	2,200	120	Prim.	65.0		NC	15	5	Prom.	No	P
5,060	20.0	15.0	150	Prim.			NC	25		Disc.	No	P (Exp. UL)
4,878	26.0	1.70	138	Prim.	60.0		HF	124	95	Prom.	Yes	FW
4,500	19.0	30.0	160	Prim.			JS					
1,100-1,700	30.0	5.50	82	Gas inj.			JS	72,316		TETT	TETT	FW
12,760	32.0	0.50	225	WF	22.0	2.0	NC	20	20	Succ.	No	P (Exp. L)
2,500	14.0	283	123	WF	51.0	30.0	HF	50	50	Succ.	No	P
2,500	14.0	283	123	WF	51.0	30.0	JS	250	250	Succ.	No	FW
8,800	27.0	0.90	200	Prim.	65.0	25.0	JS	50,000	5,000	Prom.		P (Exp. L)
4,800	27.0	3.50	120	Prim.	45.0	30.0	HF	863	786	Succ.	Yes	FW
5,450	27.0	3.45	132	Prim.	45.0	30.0	HF	3,430	2,428	Succ.	Yes	FW
6,800	43.0	0.40	170	Prim.	73.0	31.0	HF	50	5	Succ.	Yes	FW
4,900	39.0	0.70	150	Prim.	65.0	2[illegible].0	NC	57	6	Succ.	Yes	FW
6,400	37.0	0.70	165	WF	78.0	27.0	HF	2,150	1,040	Succ.	Yes	FW
6,300	37.0	0.70	165	WF	78.0	27.0	HF	1,200	1,200	Succ.	Yes	FW
9,000	38.0	0.30	190	WF	78.0	25.0	HF	2,867	2,867	Succ.	Yes	FW
5,500	40.0	0.40	150	Prim.	77.0	26.0	NC	237	24	Succ.	Yes	FW
5,750	29.0	1.70	158	Prim.	66.0	28.0	HF	256	148	Succ.	Yes	FW
9,100	38.0	0.30	190	WF	76.0	26.0	HF	2,431	2,431	Succ.	Yes	FW
8,500	33.0	0.86	190	Prim.	70.0	30.0	HF	162	41	Succ.	Yes	FW
7,900	36.0	0.50	180	Prim.	67.0	27.0	HF	745	209	Succ.	Yes	FW
8,800	27.0	0.90	200	WF	50.0	25.0	JS	300,000	0	TETT		FW
4,900	30.0	2.30	105	Prim.	90.0		HF	3,000	3,000	Succ.		P (Exp. UL)
11,270	38-40.0	0.4-0.6	165	Prim.			JS			TETT	TETT	
9,900	48.0	0.15	260	Prim.	73.0	36.0	NC	6,600	6,600	Succ.	Yes	FW
15,600	40.0	0.36	225	Prim.	70.0	61.0	NC	600	150	Succ.	Yes	FW
13,650	45.0	0.13	274				HF	320		Succ.	Yes	FW
13,200	44.0	0.13	267				HF	697		Succ.	Yes	FW

Producing CO_2, gas EOR in U.S, — continued

Operator	Field	State	County	Start date	Area, acres	Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
True Oil	Red Wing Creek	N. Dak.	McKenzie	1/82	640	8	1	Mission Canyon	LS	10.0	0.1
Hydrocarbon immiscible											
ARCO Alaska	Kuparuk River	Alaska		2/86	15,360	49	47	Kuparuk "A" Sand	S	22.0	50
Nitrogen											
Chevron	East Painter	Wyo.	Uinta	11/83	1,500	17	7	Nugget	S	11.0	3
Chevron	Stonebluff	Okla.	Wagoner	3/82	540	18	15	Dutcher	S	16.0	200
Chevron	Painter	Wyo.	Uinta	6/80	1,360	39	19	Nugget	S	11.9	4
Exxon	Blackjack Creek	Fla.	Santa Rosa	2/81	4,600	8	8	Smackover	LS	16.0	112
Exxon	Jay-Little Escambia Creek	Fla./Ala.	Santa Rosa/ Escambia	1/81	14,415	60	33	Smackover	LS	14.0	35
Exxon	Fanny Church	Ala.	Escambia	1985	600	3	1	Smackover	LS	12.0	4.5
Phillips	Binger	Okla.	Caddo	1977	12,960	62	30	Marchand	S	7.5	0.2
Phillips	Andector Ellenburger	Tex.	Ector	11/81	1,931	22	3	Ellenburger	Dolo.	3.8	2,000
Unocal	Chunchula Fieldwide Unit	Ala.	Chunchula	4/82	23,279	37	8	Smackover Carbonate	Dolo.	12.4	10
Flue gas											
ARCO	Block 31	Tex.	Crane	6/49	7,840	191	74	Devonian	LS	12.0	5.4
Exxon	Hawkins	Tex.	Wood	4/77	10,590	491	41	Woodbine	S	28.0	3,400

Producing chemical EOR projects in U.S.

Operator	Field	State	County	Start date	Area, acres	Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Polymer											
ARCO	So. Eunice/Langlie Mattix	N.M.	Lea	8/82	2,240	39	27	Seven Rivers Queen	S	11.0	1.3
ARCO	Healdton Area III	Okla.	Carter	10/83	1,500	193	44	Penn	S	23.0	115
ARCO	Walnut Bend Unit I	Tex.	Cooke	11/83	2,487	22	18	Winger	S	17.0	103
ARCO	C-H	Wyo.	Campbell	8/84	40	3	1	Minnelusa	S	20.6	80
ARCO	Hamilton Dome	Wyo.	Hot Spring	10/84	127	14	5	Tensleep	S	14.0	58
ARCO	West Nelson Rozet	Wyo.	Campbell	3/84	440	2	2	Minnelusa	S	17.0	170
ARCO	West Rozet	Wyo.	Campbell	9/84	120	3	2	Minnelusa	S	17.0	170
Amoco	Sleepy Hollow	Neb.	Red Willow	2/85	1,600	41	10	Reagan Sand	S	24.0	2,900
Anderson Oil	North Glo	Wyo.	Campbell	10/87	292	4	2	Minnelusa	S	15.9	150
Cenex	Sage Spring Creek-Unit A	Wyo.	Natrona	8/78	1,456	8	5	Dakota	S	13.0	50
Chevron	W. Bay	La.	Plaquemines	10/81	42	4	1	3A Sand	S	34.0	4,600
Chevron	W. Bay	La.	Plaquemines	10/81	64	3	2	3A Sand	S	30.0	40
Chevron	N. Stanley	Okla.	Osage	2/76	810	18	11	Burbank	S	18.0	300
Chevron	S. Stanley	Okla.	Osage	6/83	1,280	10	16	Burbank	S	18.0	300
Chevron	C-Bar	Tex.	Crane	6/83	2,600	56	32	San Andres	Dolo.	10.0	6
Chevron	Dune	Tex.	Crane	3/82	410	26	14	San Andres	Dolo.	14.0	28
Chevron	Goldsmith 5600	Tex.	Ector	9/83	3,840	139	51	Clearfork	Dolo.	15.0	28
Chevron	McElroy	Tex.	Crane	10/82	3,200	242	56	Grayburg	Dolo.	13.0	6
Chevron	N. Ward Estes	Tex.	Ward	12/81	17,986	785	666	Yates	S	18.0	10
Conoco	Vacuum-State 35 Lease	N.M.	Lea	3/83	240	8	9	Grayburg/San Andres	S/LS	10.9	13.7
Enron Oil & Gas	Isenhour	Wyo.	Sublette	7/80	173	4	2	Almy	S	15-20.0	1-25
Enron Oil & Gas	Long Island-Star Corral	Wyo.	Sublette	8/69	173	5	2	Almy	S	15.5	1-50
Enron Oil & Gas	McDonald Draw 1TB	Wyo.	Sublette	1/72	435	1	1	Almy	S	16.7	2-59
Enron Oil & Gas	McDonald Draw 4TB	Wyo.	Sublette	7/72	420	13	10	Almy	S	18.0	1-200
Enron Oil & Gas	Ruben	Wyo.	Sublette	12/70	800	12	6	Almy	S	14.1	1-56
Enron Oil & Gas	Saddle Ridge Unit	Wyo.	Sublette	12/74	376	9	8	Mesaverde	S	22.0	10-95
Exxon	Loudon	Ill.	Fayette	1985		760	554	Chester	S	19.0	30-500
Exxon	Omaha	Ill.	Gallatin	1984		15	4	Chester	S	18.0	20-387
Exxon	Roland	Ill.	White	1985		16	14	Chester	S	15.7	16-626
Exxon	Roland	Ill.	White/Gallatin	1985		12	8	Chester	S	19.5	113-279
Exxon	Trapp	Kan.	Russell	1984		15	9	Lansing/Kansas City	LS	18.4	0.1-300
Exxon	W. Yellow Creek	Miss.	Wayne	9/76	4,813	51	24	Eutaw	S	24.0	112
Exxon	Camrick	Okla.	Beaver/Texas	1984		43	27	Upper Morrow	S	15.0	1-250
Exxon	Hewitt	Okla.	Carter	3/81	886	85	52	Hewitt	S	21.0	175
Exxon	Conroe	Tex.	Montgomery	1985				2B	S		50-5,500
Exxon	Webster	Tex.	Harris	1985		7	3	Frio 1A	S	28.0	206
Fina Oil and Chemical	Garza	Tex.	Garza	10/82	120	10	5	San Andres	LS	19.8	4.1
Fina Oil and Chemical	Westbrook	Tex.	Mitchell	12/80	4,740	153	38	Clearfork	LS	7.4	6.3
Fina Oil and Chemical	South Cowden	Tex.	Ector	6/84	666	20	7	Grayburg	Dolo.	10.1	4.1
Gallagher Drilling	Stewart East Minnelusa Unit	Wyo.	Campbell	7/82	200	4	1	Minnelusa	S	15.6	250
Graham Resources	Carthage	Tex.		12/82		16	9	Morrow	S	19.0	200
Hunt	East Texas	Tex.	Rusk	8/82	508	78	14	Woodbine	S	22.0	300
Marathon Oil	Main Consolidated	Ill.	Crawford	7/81	130	8	12	Robinson	S	18.0	115
Marathon Oil	Yates	Tex.	Pecos	12/83	6,900	313	270	Queen Grayburg/ San Andres	Dolo.	15.0	62
Marathon Oil	Byron	Wyo.	Big Horn	12/82	1,500	51	39	Embar/Tensleep	LS/S	13.9	4.5/78
Marathon Oil	Grass Creek	Wyo.	Hot Springs	10/85	740	40	18	Phosphoria/Tensleep	LS/S	21.6/13.1	20/112
Marathon Oil	Kinney Coastal	Wyo.	Park/Big Horn	11/84	1,500	36	23	Tensleep	S	11.2	50
Marathon Oil	Oregon Basin-North Embar Tensleep	Wyo.	Park	11/83	3,000	152	79	Embar/Tensleep	LS/S	20.2/14.7	68/193
Marathon Oil	Oregon Basin-SETPA	Wyo.	Park	1/85	6,108	180	33	Embar/Tensleep	LS/S	15.9/19.5	39/140
Mitchell Energy	Alba Northeast Unit	Tex.	Wood	7/80	410	10	2	Sub-Clarksville	S	21.4	471
Mitchell Energy	Alba SEFB Unit	Tex.	Wood	2/72	731	13	4	Sub-Clarksville	S	23.3	525
Mitchell Energy	Jacksboro S.	Tex.	Jack	5/82	270	7	8	Strawn	S	19.9	86.0
Mitchell Energy	Lucy N.	Tex.	Borden	10/83	550	8	4	Pennsylvanian	LS	9.7	30

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project status[1]	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
9,000	40.0	0.25	241	Prim.	60.0	20.0	JS	1,000		Succ.	Yes	FW
6,000	24.0	2.20	158	WF	57.0	54.0	JS	48,000		Prom.	Yes	P (Exp. L)
12,000	46.0	0.20	185	HC gas cycling	98.5	52.0	HF	10,000	1,000	TETT		FW
1,200	28.0	5.00	85	Prim.	67.0		HF	80	50	TETT		FW
11,500	46.0	0.20	174	HC gas cycling	47.0		HF	3,800	2,550	TETT		FW
15,700	48.0	0.30	286	WF	59.0		JS	3,600	1,500	Prom.	Yes	
15,400	51.0	0.20	285	WF	59.0	46.0	JS	20,800	7,600	Prom.	Yes	
15,565	51.0	0.15	288	Prim.	76.0		JS			TETT	TETT	
10,000	38.0	0.30	190	Prim.	98.0	75.0	HF	2,300	2,300	Succ.	Yes	FW
8,835	44.0	0.60	132	Prim.	43.8	37.0	HF	4,420		Succ.	Yes	FW
18,500	54.0	0.18	325	Prim.	80.0	45.0	JS	9,200	4,050	Succ.	Yes	FW
8,600	46.0	0.30	130	Prim.			NC	8,000	6,400	Succ.	Yes	FW
4,530	24.0	3.70	168	Prim.			HF		15,000	Succ.	Yes	

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project maturity	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
3,700	35.0	2.60	90	WF	63.0	60.0	HF	420		Prom.	Yes	
1,000	31.0	13.0	87	WF	37.0	35.5	HF	850		Succ.	Yes	FW
5,500	32.0	2.80	143	WF	39.0	26.0	NC	410		Prom.		FW
7,500	20.7	26.0	135	WF			NC	94		Prom.		P (Exp. UL)
2,750	20.0	39.0	135	WF			HF	900		Prom.	Yes	FW
8,700	21.0	12.0	197	WF			HF	200		Prom.		P
8,700	22.0	24.0	170	WF			HF	150		Prom.		P
3,500	31.0	20.0	95	WF			JS	2,400	1,200	Prom.	Yes	FW
7,900	20.2	29.7		Prim.	74.4	33.3	JS			TETT		FW
7,400	36.0	1.40	160	WF	45.0	21.0	NC	400	200	Succ.	Yes	FW
7,100	30.0	2.40	165	Prim.	65.0		HF				No	
7,100	41.0	2.30	120	WF	36.0	32.0	HF			TETT	TETT	
2,900	36.0	2.36	107	WF	51.0		NC	280	80	Succ.		FW
2,900	32.0	2.50	165	Prim.	54.0		HF	90	15	NE		FW
3,500	36.0	5.00	107	WF	39.0		NC	240		Succ.	Yes	FW
3,350	32.0	3.50	95	WF	64.0		NC	250		Succ.	Yes	FW
5,600	32.0	3.50	100	WF	49.0		NC	1,310	390	Succ.	Yes	FW
2,800	32.0	2.70	88	WF	58.0		HF	5,000		Succ.	Yes	FW
2,600	33.0	1.50	95	WF	42.0		NC	5,700		Succ.	Yes	FW
4,500	37.0	1.30	101	Prim./WF			HF	791		Succ.	Yes	FW
3,600	41.5	1.20	100	Prim.	38.1	27.0	HF	175	11	Succ.	Yes	FW
3,550	44.0	1.20	100	Prim.	43.6	23.9	NC	50	2	Succ.	Yes	FW
3,050	42.0	1.40	90	WF	40.0	36.7	NC	30	1	Succ.	Yes	FW
3,200	41.8	1.45	95	WF	43.8	29.1	NC	180	9	Succ.	Yes	FW
3,300	43.0	0.95	95	Prim.	42.0	25.4	NC	220	11	Succ.	Yes	FW
1,800	44.0	2.33	85	Prim.	37.5	27.3	NC	200	12	Succ.	Yes	FW
1,800	36.0	6.00	75	WF			JS			TETT	TETT	
1,950	28.0	17.0	78	WF			JS			TETT	TETT	
3,100	36.0	10.0	87	WF			JS			TETT	TETT	
3,000	32.0	10.0	83	WF			JS			TETT	TETT	
3,215	38.0	1.40	97	WF			JS			TETT	TETT	
4,950	20.0	20.0	150	WF	84.0	75.0	NC			Succ.	Yes	
7,530	39.0	1.50	142	WF			JS			TETT	TETT	
2,400	35.0	8.70	96	WF	43.0		HF			Prom.	Yes	
4,900			170	Prim.			JS			TETT	TETT	
5,900	29.0	1.30	165	WF			JS			TETT	TETT	
2,900	36.0	2.50	90	WF	40.0		NC	680		NE	Yes	
3,000	26.0	9.10	90	WF	50.0		NC	1,700		NE	Yes	
4,500	35.0	1.90		WF	57.0	53.0	HF	1,250		Prom.	Yes	FW
8,000	20.0	20.0	124	Prim.	65.0	37.7	HF	170	120	Succ.	Yes	FW
4,500	39.0			Prim./WF	50.0	40.0	NC	900	550	Succ.	Yes	FW
3,500	37.0	1.90	142	Prim.	57.0	33.0	NC	530	355	Succ.	Yes	LW
1,100	30.0	18.0	70	Prim.	51.0		NC	20	20	Disc.	No	P (Exp. UL)
1,500	30.0	5.50	82	Prim.			HF	15,567		Succ.	Yes	FW
5,600	23.0	17.0	121	Prim./WF			NC	3,200	413	Succ.	Yes	FW
4300/4500	24.0/24.0	15/15	105/110	Prim./WF			HF	2,050	1,000	Succ.	Yes	FW
4,240	22.1	20.0	140	Prim./WF			JS	1,538	365	Prom.	Yes	FW
3370/3520	22.5/22.1	8.2/10.0	108/110	Prim./WF	45.0		HF	12,500	2,600	Succ.	Yes	FW
3600/3840	21.0/21.0	15.7/15.7	105/180	Prim./WF	54.0	39.0	NC	10,400	3,000	Succ.	Yes	FW
4,100	15.1	75.0	150	WF	62.6	58.7	NC	54	54	Disc.		FW
4,200	15.5	75.0	150	Prim.	69.5	60.7	NC	63	63	Succ.	Yes	FW
1,975	40.0	1.73	100	Prim.	50.0	22.0	NC	209	209	Succ.	Yes	FW
7,640	40.0	0.44	140	Prim.	52.6	35.7	HF	485	30	TETT	TETT	FW

Producing chemical EOR projects in U.S. — continued

Operator	Field	State	County	Start date	Area, acres	Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Mobil	Vacuum	N.M.	Lea	5/84	320	10	4	San Andres	Dolo.	10.4	3-100
Mobil	Cement	Okla.	Caddo	11/81	1,510	96	23	Fortuna/Noble-Olson	S	19.2	18
Mobil	Cement	Okla.	Caddo	9/81	1,120	71	23	Fortuna/Noble-Olson	S	36.1	74
Mobil	Cushing	Okla.	Creek	5/84	120	1	2	Bartlesville	S	19.0	290
Mobil	Fitts	Okla.	Pontotoc	7/82	1,520	148	87	Cromwell 60	S/LS	10-25.0	6-60
Mobil	Golden Trend	Okla.	Garvin/Grady	10/85	800	14	4	Springer	S	12.5	58
Mobil	Healdton	Okla.	Jefferson/ Carter	7/81	1,045	151	41	Healdton	S	24.2	386
Mobil	Postle, Hough, Morrow 'A' Unit	Okla.	Texas	7/82	3,360	24	15	Morrow	S	15.8	45
Mobil	Postle, Hovey, Morrow Unit	Okla.	Texas	9/82	7,881	34	17	Morrow	S	16.8	45
Mobil	Postle, Postle Upper Morrow Unit	Okla.	Texas	11/82	3,944	29	19	Morrow	S	15.4	45
Mobil	Postle, West Hough, Morrow Unit	Okla.	Texas	4/83	7,601	39	24	Morrow	S	15.7	45
Mobil	Sho-Vel-Tum	Okla.	Carter	7/82	780	35	29	Deese	S	18.8	95.3
Mobil	Sho-Vel-Tum	Okla.	Carter	10/82	450	21	14	Deese	S	17.0	45-860
Mobil	Sho-Vel-Tum	Okla.	Stephens	11/82	1,980	100	43	Deese	S	17.4	44.8
Mobil	Sho-Vel-Tum	Okla.	Carter	8/82	451	30	6	Deese	S	20.0	192
Mobil	Sho-Vel-Tum	Okla.	Stephens	8/82	350	20	11	Deese	S	16.0	4.5-123
Mobil	Sho-Vel-Tum	Okla.	Carter	7/82	2,750	136	56	Tatums Stray Pennington	S	22.3	787
Mobil	Sho-Vel-Tum	Okla.	Stephens	8/82	1,360	71	52	Deese Springer	S	18.1	66
Mobil	Sho-Vel-Tum	Okla.	Carter	7/82	1,700	109	53	Deese	S	17.2	100
Mobil	Salt Creek	Tex.	Kent	12/84	12,100	176	85	Canyon Reef	LS	12.0	20
Natl. Coop. Refinery Assn.	Stewart Ranch	Wyo.	Campbell	2/72	1,200	14	14	Minnelusa	S	16.5	92
Oxy USA	Harmony Hill	Kan.	Rooks	10/84	130	5	3	Lansing/Kansas City	LS	12.5	
Oxy USA	Hoof	Kan.	Graham	6/82	960	18	8	Lansing/Kansas City	LS	12.0	74-113
Phillips	South Cowden	Tex.	Ector	9/83	2,050	54	23	Grayburg	Dolo.	11.9	3.7
Phillips	Vacuum	N.M.	Lea	8/83	320	14	8	San Andres	Dolo.	11.5	17
Phillips	North Burbank	Okla.	Osage	9/80	1,440	64	36	Burbank	S	15.5	50
Santa Fe Energy	Candy Draw	Wyo.	Campbell	5/87	482	9	1	Minnelusa	S	16.0	
Shell	Big Mineral Creek-Barnes Sand Unit	Tex.	Grayson	12/84	1,065	14	18	Barnes Sand	S	18.5	59
Shell	Big Mineral Creek-S Sand Unit	Tex.	Grayson	5/85	1,600	22	14	S Sand	S	13.0	28
Sun	Fitts	Okla.	Pontotoc	1982	3,030	88	102	Viola	LS	13.6	1-36
Sun	Hitts Lake	Tex.	Smith	10/80		22	8	Paluxy	S	18.9	300
Sun	Stephens County Regular	Tex.	Stephens	2/80	3,900	67	62	Caddo	LS	14.2	11
Sun	Stephens County Regular	Tex.	Stephens	2/80	700	11	12	Caddo	LS	14.2	11
Sun E&P	Stephens County Regular	Tex.	Stephens	3/86	3,026	63	75	Caddo	LS	14.0	10
Tesoro Petroleum	Hospah Sand Unit	N.M.	McKinley	1/83	1,061	31	16	Upper Hospah	S	24.7	467
Tesoro Petroleum	S. Hospah Lower Sand Oil Pool	N.M.	McKinley	10/83	594.6	50	13	Lower Hospah	S	27.3	1,282
Tesoro Petroleum	Elaine (San Miguel)	Tex.	Dimmit	12/81	1,260	11	13	San Miguel	S	21.7	6
Texaco	Vacuum Grayburg-San Andres	N.M.	Lea	7/82	1,486	37	29	Grayburg/San Andres	Dolo.	11.0	18
Texaco	Carthage N.E.	Okla.	Texas	4/83	1,024	7	4	Morrow 'A'	S	18.6	92
Texaco	Hewitt	Okla.	Carter	4/84	220	8	5	Hoxbar	S	21.0	84
Texaco	Hewitt	Okla.	Carter	8/82	300	6	5	Hoxbar	S	19.0	270
Texaco	Hewitt	Okla.	Carter	11/85	100	6	3	Lone Grove	S	18.0	50
Texaco	Naval Reserve	Okla.	Osage	2/82	2,360	90	28	Bartlesville	S	15.8	12
Texaco	Sho-Vel-Tum	Okla.	Carter	2/83	225	14	5	Deese	S	17.0	59
Texaco	Sho-Vel-Tum	Okla.	Carter	1/83	1,390	73	34	Hoxbar Deese	S	20.3	200
Texaco	Sho-Vel-Tum	Okla.	Carter	5/85	570	32	22	Deese	S	17.0	70
Texaco	Sho-Vel-Tum	Okla.	Stephens	8/81	190	7	4	Deese	S	17.4	216
Texaco	Black Diamond	Tex.	Jim Hogg	4/83	200	4	3	Pettus II	S	25.0	212
Texaco	Slaughter	Tex.	Cochran	12/81	7,406	275	90	San Andres	Dolo.	10.7	3
Texaco	Slaughter	Tex.	Cochran	2/84	1,887	33	15	San Andres	Dolo.	11.2	6.02
Toco Corp.	Clareton	Wyo.	Weston	10/85	200	6	1	Newcastle	S	15-18.0	1-15
Toco Corp.	Mush Creek	Wyo.	Weston	1969	900	8	6	Newcastle	S	15-18.0	1-15
Unocal	Dos Cuadras	Calif.	Santa Barbara	6/83	320	37	10	EP/FP	S	27-31.0	260-680
Unocal	Healdton	Okla.	Carter	12/82	2,010	162	105	Healdton Sands	S	26.2	346
Unocal	Osage-Hominy	Okla.	Osage	4/83	2,880	97	6	Miss. Chat	Chert LS	30.0	27
Unocal	Farnsworth	Tex.	Ochiltree	9/83	13,005	35	40	Morrow	S	14.5	21.8
Unocal	Howard Glasscock	Tex.	Howard	1/83	169	12	11	Queen	S	22.0	37
Unocal	Southwest Van Unit	Tex.	Van Zandt	9/84	529	24	29	Lewisville	S	26.0	100
Micellar-polymer											
Chevron	Berry Hill (Kiefer)	Okla.	Creek	9/82	82	12	21	Glenn	S	20.0	150
Gary	S. Johnson	Ill.	Clark	6/81	49	36	22	Partlow	S	18.3	302
Marathon Oil	Lawrence Robins 102 B Maraflood	Ill.	Lawrence	8/82	25	12	5	Bridgeport	S	21.0	398
Marathon Oil	Lawrence-Robins 202-B Project	Ill.	Lawrence	10/85	1.25	4	1	Bridgeport Main	S	20.6	352
Marathon Oil	Main Consolidated M-1 Project	Ill.	Crawford	2/77	407	56	60	Robinson	S	19.0	102
Marathon Oil	Main Consolidated M-2 Project	Ill.	Crawford	7/80	331	72	53	Robinson	S	19.0	150
Oxy USA	Madison	Kan.	Greenwood	8/82	40	15	16	Bartlesville	S	18.9	42
Texaco	Salem Consolidated	Ill.	Marion	8/81	60	20	12	Benoist	S	15.4	154
Texaco	Sho-Vel-Tum	Okla.	Stephens	8/83	8.75	3	3	Sims		17.0	83
Alkaline											
Conoco	San Miguelito	Calif.	Ventura	11/82	316	16	11	Third Grubb	S	15.1	36
Unocal	South Van Unit	Tex.	Van Zandt	9/80	800	6	12	Lewisville	S	26.0	100
Unocal	Carroll Unit	Tex.	Van Zandt	11/81	212	3	7	Lewisville	S	26.0	100
Shell Offshore	White Castle	La.	Iberville	9/87	1	2	1	Q RA SU	S	31.0	1,000

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project status†	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
4,700	37.0	1.02	101	Prim./WF	38.0	30.0	HF	300		TETT	Yes	P (Exp. UL)
2,000-3,200	35.0	5.00	95	WF	52.0		HF	350	60	Succ.	Yes	FW
2,400-3,325	35.0	6.00	95	WF	57.0		HF	615	70	Succ.	Yes	FW
2,700	39.0	4.00	94	WF	31.0		JS	125	35	Succ.	Yes	FW
2,500-4,000	40.0	4.00	115	WF	57.0		HF	2,775	740	Succ.	Yes	FW
9,400	38.0	3.00	160	WF	49.0		JS	250	30	Succ.	Yes	P (Exp. L)
1,000	32.0	10.0	84.2	WF	46.2		HF	708	100	Succ.	Yes	FW
6,200	41.0	1.03	147	WF	39.0	37.0	NC	624	180	Succ.	Yes	FW
6,200	41.0	1.03	146	WF	45.0	44.0	NC	500	20	Succ.	Yes	FW
6,100	40.0	1.03	147	WF	40.0	38.0	NC	260	100	Succ.	Yes	FW
6,500	40.0	1.03	145	WF	43.0	41.0	NC	740	120	Succ.	Yes	FW
3,500	30.0	15.7	112	WF	47.9		HF	413	30	Succ.	Yes	FW
3,500	28.0	20.0	80	WF	49.0		HF	153	20	Succ.	Yes	FW
4,900	26.0	13.6	120	WF	47.0		HF	580	10	Disc.	No	FW
3,900	34.0	10.5	89	WF	53.0		HF	570	313	Succ.	Yes	FW
4,000	31.0	5.60	105	WF	36.0		HF	40	5	Disc.	No	FW
2,750	25.0	68.0	83	WF	48.0		HF	1,847	380	Succ.	Yes	FW
4,400	30.0	16.0	117	WF	55.0		HF	1,052	170	Succ.	Yes	FW
3,350	30-38.0	3-5-10	102	WF	52.4		HF	1,330	100	Succ.	Yes	FW
6,300	39.2	0.85	129	WF	60.0	58.0	NC	27,699	2,800	Succ.	Yes	FW
8,100	20.0	25.0	136	WF	68.0	49.0	NC	1,013	1,013	Succ.	Yes	FW
3,130	38.6	3.70	105	Prim.	49.0	34.0	JS	65	65	Succ.	Yes	FW
3,700	41.0	2.30	120	WF	36.0		JS	62	62	TETT	NE	FW
4,750	35.0	3.40	96	WF	67.0	59.0	NC	1,000		Disc.	No	FW
4,500	37.0	1.20	101	Prim.	74.9	58.2	NC	1,400		Succ.	Yes	FW
2,900	39.0	3.00	120	WF	53.0	47.0	NC	575	355	Succ.	Yes	FW
7,300	26.0			Prim.			JS	1,300	1,300	Prom.		
5,000	37.0	1.50	120	WF	50.0	47.0	JS	300	0	Disc.	No	P (Exp. UL)
5,200	37.9	1.67	124	WF	44.0	37.0	JS	570	0	Disc.	No	FW
	39.0	3.20	119	WF			HF	2,469		Succ.	Yes	FW
7,250	26.0	2.71	210	WF			HF	1,135		Succ.	Yes	FW
3,300	39.0	1.80	131	WF			HF	2,366		Succ.	Yes	FW
3,300	39.0	1.80	131	WF			HF	174		Succ.	Yes	FW
3,200	39.0	3.00	130	WF			HF	1,430		Prom.		FW
1,600	30.0	13.0	95	WF	69.0	68.2	JS	163	23	Succ.	Yes	FW
1,600	24.0	35.0	95	WF	82.5	65.9	JS	483	25	Succ.	Yes	FW
4,450	36.0	3.00	140		80.2	67.0	HF	117	82	Succ.	Yes	FW
4,720	38.0	1.47	105	WF	45.0	44.0	NC	3,650	0	Succ.	Yes	FW
4,400	40.0	2.00	113	WF	45.0	44.5	C	209	60	Succ.	Yes	FW
2,400	33.0	10.0	94	WF	39.0	37.0	C	102	46	Succ.	Yes	FW
2,350	35.0	6.00	98	WF	40.0	39.8	C	41	10	Succ.	Yes	FW
4,000	30.0	4.30	115	WF	39.0	37.0	C	135	31	Succ.	Yes	FW
2,650	38.0	3.50	90	WF	27.2	26.7	C	463	15	Succ.	Yes	FW
4,400	20-34.0	4.30	102	WF	38.0	37.2	C	94	8	Disc.	Yes	FW
3,100	25.0	20.0	95	WF	49.0	47.8	C	1,520	200	Succ.	Yes	FW
3,500	34.0	10.0	110	Prim.	57.0	55.0	NC	1,059	320	Succ.	Yes	FW
5,500	22.0	60.0	124	Prim.	64.0	56.0	C	88	29	Succ.	Yes	FW
4,550	48.0	0.40	164	Prim.	68.0	41.0	C	202	178	Succ.	Yes	FW
5,000	31.0	1.47	107	WF	49.4	45.6	C	6,150	900	Succ.	Yes	FW
5,000	31.0	1.47	110	WF	53.0	50.0	NC	291	0	Disc.	Yes	FW
6,000	40.0		160	Prim.			JS	5	5	TETT	TETT	P (Exp. UL)
4,400	40.0		115	Prim.			NC	90	90	Succ.	Yes	FW
1,280-1,650	25-26.0	15-24	95-103	WF	54-59	44-47	JS	3,100	0	TETT	TETT	FW
800	33.0	10.0	80	WF	56.0	47.0	HF	1,270	80	Succ.	Yes	FW
2,880	39.0	3.00	100	WF	51.0	48.0	HF	1,090	55	Succ.	Yes	FW
7,400	38.0	1.00	141	WF	43.0	40.0	HF	190	10	Disc.	Yes	FW
1,600	32.0	10.0	90	WF	50.7	43.4	JS	76	32	Succ.	Yes	FW
2,600	35.0	2.30	130	WF			JS	762	5	Prom.	Yes	FW
1,300	39.0	4.40	100	WF	50.0		HF	1,000	990	Succ.		FW
475	30.0	20.0	65	WF	46.0	28.0	HF	60	40	TETT	No	
950	29.0	18.0	70	Prim./WF	45.0		HF	250	250	TETT	TETT	P (Exp. UL)
900	29.0	18.0	70	WF	45.0		HF	20	20	TETT	TETT	P (Exp. UL)
1,000	36.0	6.00	70	Prim./WF	40.0		NC	100	100	Prom.	No	FW
1,000	35.0	7.00	70	Prim./WF	40.0		JS	50	50	TETT	TETT	FW
1,900	38.0	2.90	97	Prim.	34.0		NC			NE	No	P (Exp. UL)
1,750	36.0	36.0	72	WF	30.5	15.3	C	110	110	Prom.	No	P (Exp. UL)
7,000	28.0	12.0	135	WF	50.0	45.0	C	30	30	Disc.	No	P (Exp. UL)
8,011	31.0	0.70	205	Prim./WF	70.0	55.0	JS	950			TETT	FW
2,600	35.0	2.30	130	WF			NC	88	0	Disc.	Yes	FW
2,600	33.0	2.30	130	WF			NC	9	0	Disc.	Yes	FW
5,600-5,800	25.0	3.00		Aquifer influx	22.0	16.0	HF			TETT		P

Completed, terminated U.S. projects*

Operator	Field	State	County	Start date	Area, acres	— Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Alkaline											
Chevron	Quarantine Bay	La.	Plaquemines	11-81	200	5	3	3 (RB)SU	S	27.0	50-2,000
Chevron	Whittier	Calif.	Los Angeles	2-83	373	25		2nd & 3rd Zones	S	28.0	350
Mobil	Torrance	Calif.	Los Angeles	6-81	604	45	21	Main	S	31.0	220
Biopolymer											
Apache	Dry Creek	Neb.	Hitchock	7-85	500	9	5	Lansing/Kansas City	LS	13.0	13
CO_2 immiscible											
Phillips	Lick Creek	Ark.	Bradley-Union	1-76	1,640	39	13	Meakin	S	30.3	1,200
Texaco	Bayou Sale	La.	St. Mary	5-84	564	5	2	St. Mary	S	31.0	500
Texaco	West Delta Block 109	La.	Offshore	6-85	75	1	1	13100-Foot	S	29.7	68
Texaco	West Delta Block 109	La.	Offshore	6-85	74	1	1	10800-Foot	S	30.0	1,900
Texaco	Magnet Withers Pierce Estates B&C	Tex.	Wharton	7-83	500	4	0		S	23.0	1,700
Texaco	Pickett Ridge	Tex.	Wharton	5-83	726	4	0	Pickett Ridge	S	30.0	1,200
Texaco	Thompson	Tex.	Fort Bend	1-83	100	2	0	Frio	S	27.0	100-1,000
Texaco	Paradis	La.	St. Charles	3-84	110	2	2	Main Pay	S	28.0	1,033
Texaco	Manvel	Tex.	Brazoria	11-83	128	1	0	Oligocene	S	30.0	1,000
Texaco	Cote Blanche Bay West	La.	St. Mary	3-84	55	3	3	14 Sand	S	29.0	322
Texaco	West Delta Block 109	La.	Offshore	6-85	48	1	1	10200-Foot	S	27.0	205
Texaco	South Marsh Island Block 6	La.	Offshore	6-85	82	2	1	Rob E-S	S	29.6	323
Texaco	Lake Barre	La.	Terrebonne	3-84	1,164	12	4	Upper M	S	25.0	139
Texaco	Manvel	Tex.	Brazoria	10-82	43	1	0	Oakville	S	30.0	400
Texaco	Lafitte	La.	Jefferson	8-84	271	5	2	8900-Foot	S	27.0	250
Texaco	Pierce Ranch	Tex.	Wharton	1-83	480	8	0	Pierce Ranch	S	31.8	534
Texaco	West Columbia	Tex.	Brazoria	6-83	33	3	0	PTSD	S	30.0	560
Texaco	Magnet Withers BH&S State Tracts J.E. Broussard A.C. Thompson	Tex.	Wharton	10-83	1,224	1	0	Magnet Withers	S	23.0	1,700
Texaco	Withers North	Tex.	Wharton	3-83	454	10	0	Withers N.	S	25.0	1,050
Texaco	West Delta Block 109	La.	Offshore	6-85	78	1	1	12500-Foot	S	27.0	1,032
CO_2 miscible											
ARCO	Garber	Okla.	Garfield	10-81	80	9	4	Crews	S	19.0	12
Chevron	University Waddell	Tex.	Crane	5-83	920	49	13	Devonian	Dolo.	12.0	14
Citronelle Unit	Citronelle	Ala.	Mobile	5-81	13,640	42	10	Rodessa	S	15.0	13
Grace Petroleum	South Bishop Ranch	Wyo.	Campbell	1-82	640	5	2	Minnelusa	S	16.0	50
Grace Petroleum	South Bishop Ranch	Wyo.	Campbell	1-82	1,280	5	4	Minnelusa	S	15.0	150
Carbonated waterflood											
Amoco	San Andres	Calif.	Fullerton	10-85	1,600	40	32	San Andres	Dolo./LS	13.0	1.4
Combustion											
Bayou State	Caddo Pine Island	La.	Caddo	1979	20	13	3	Nacatoch	S	30.0	500
Lawrence-Allison	Teapot Dome NPR-3	Wyo.	Natrona	9-80	10	9	8	Shannon	S	18.0	63
Marathon Oil	Main Consolidated	Ill.	Crawford	10-61	517	51	5	Robinson	S	19.7	320
Mobil	South Belridge	Calif.	Kern	1964	245	24	0	Tulare	S	35.0	3,000
Texaco	Camp Hill	Tex.	Anderson	9-85	17.4	29	6	Carrizo	S	38.0	4,000
Unocal	Brea-Olinda	Calif.	Orange	3-72	17.1	12	2	1st Miocene	S	29.0	300
Hydrocarbon miscible											
Amoco	Slaughter	Tex.	Hockley	4-72	12.2	2	6	San Andres	Dolo.	10.5	4.3
Chevron	Swanson River	Alaska		11-83	2,660	33	8	Hemlock	Congl.	21.0	143
Exxon	Means	Tex.	Andrews	11-83	8,700	438	184	San Andres	Dolo.	9.0	20
Mitchell Energy	Alvord (3,000 ft Strawn)	Tex.	Wise	7-80	217	6	3	Bryson	S	20.0	46
Micellar-polymer											
Amoco	Torchlight	Wyo.	Big Horn	1981	6.4	1	4	Tensleep	S	14.2	61
Gary	Bell Creek Unit 'A'	Mont.	Powder River	2-81	179	2	0	Muddy	S	24.9	1,218
Marathon Oil	Main Consolidated 219-R Project	Ill.	Crawford	10-75	113	2	0	Robinson	S	20.8	105
Marathon Oil	Main Consolidated 119-R Project	Ill.	Crawford	9-68	40	27	18	Robinson	S	20.0	200
Mitchell Energy	Wizard Wells	Tex.		1981	700	11		Caddo	S	14.0	50
Mobley O.B.	Lewisville	Ark.	Lafayette	7-80	458	8	3	Smackover	LS	21.8	24
Pennzoil	Bradford	Pa.	McKean	7-82	220	132	57	Bradford 3rd	S	21.0	188
Phillips	N. Burbank	Okla.	Osage	1975	90	16	9	Burbank	S	15.5	50
Texaco	Main Consolidated	Ill.	Crawford	12-81	10.88	9	0	Robinson		21.8	100
Unocal	East Coalinga Extension	Calif.	Fresno	12-80	90	18	4	Gatchell	S	14.2	150
Nitrogen											
Texaco	Vealmoor East	Tex.	Borden/Howard	12-81	3,353	34	8	Canyon	LS	9.5	38
Polymer											
ARCO	Camrick District	Okla.	Beaver	9-84	2,980	12	10	Upper Morrow	S	15.0	14
ARCO	Horseshoe Gallup	N.M.	San Juan	11-83	450	10	8	Gallup	S	15.0	14
ARCO	Roehrs	Wyo.	Campbell	9-84	324	1	1	Minnelusa	S	17.0	92
ARCO	East Texas (Kinney Strickland Leases)	Tex.	Gregg & Rusk	3-85	380	59	14		S	25.0	2,000
Conoco	South Elk Basin	Wyo.	Park	11-84	540	6	1	Embar/Tensleep	S	15.1	90
Conoco	Frannie	Wyo.	Park	9-85	2,020	64	50	Phosphoria/Tensleep	S	13.6	130
Grace Petroleum	High Five	Mont.	Roseland	7-81	800	9	2	Stensvad	S	18.0	200
Lawrence-Allison	Teapot Dome NPR-3	Wyo.	Natrona	10-82				Shannon	S	18.0	63
Mobil	Sho-Vel-Tum	Okla.	Stephens/Carter	12-82	1,285	32	8	Springer	S	15.4	17.9
Oxy USA	Beverly Hills West Pico	Calif.	Los Angeles	12-84				Repetto Main	S	26.6-28.0	77-193
Phillips	Lick Creek	Ark.	Bradley-Union	9-84	1,640	39	23	Meakin	S	30.3	1,200

Table H

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project status[1]	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
8,200	33.0	5.00	182	Prim.	51.0					Disc.	No	
2,300	20.0	30.0	120	WF	27.0	22.0		175	175	Disc.	No	
3,500	21.0	17	165	WF	40.7	39.6	Term. 1986	2,450		Disc.	No	
4,100	31.0	9	120	Prim.			Term.			None	No	P
2,500	17.0	160	118	Prim.	55.0	46.0	Term.	450	400	Succ.	Yes	FW
10,000	34.0	0.4	194	Prim.	50.0	45.0	Term.	1,500	0	Succ.	Yes	RW
11,325	37.0	0.3	210	Prim.	50.0	45.0	Term.	1,600	0	Disc.	Yes	RW
10,500	36.5	0.28	200	Prim.	50.0	45.0	Term.	400	0	Succ.	Yes	RW
5,500	26.0	2.3	154	Gas inj.	35.0	34.0	Term.	193	0	Disc.	Yes	FW
4,600	25.0	2.5	138	Prim.	29.0	28.0	Term.	93	0	Disc.	Yes	FW
5,100	25.2	2.7	120	Prim.	42-65		Term.	66	0	Disc.	Yes	FW
10,200	38.0	0.5	195	WF	50.0	45.0	Term.	350	0	Succ.	Yes	RW
5,000	26.7	7.2	149	Prim.	45.0	20.0	Term.	598	0	Disc.	Yes	FW
8,000	32.0	1.3	184	WF	50.0	45.0	Term.	100	0	Succ.	Yes	RW
10,000	37.3	0.26	194	Prim.	50.0	45.0	Term.	675	0	Disc.	Yes	RW
11,200	34.0	0.3	208	Prim.	50.0	45.0	Term.	250	0	Succ.	Yes	RW
13,000	33.0	0.4	236	WF	50.0	45.0	Term.	760	0	Succ.	Yes	RW
4,000	25.0	4.4	149	Prim.	42-65		Term.	122	0	Disc.	Yes	FW
8,900	34.0	0.7	185	Prim.	50.0	45.0	Term.	370	0	Succ.	Yes	RW
4,900	24.4	4.57	155	Prim.	48.0	18.0	Term.	404	0	Disc.	Yes	FW
2,600	30.0	8	116	Prim.	36-48	10-20	Term.	198	0	Disc.	Yes	FW
5,500	26.0	2.3	154	Gas inj.	35.0	31.0	Term.	37	0	Disc.	Yes	FW
5,250	25.7	2.45	145	Prim.	35.0	32.0	Term.	298	0	Disc.	Yes	FW
12,000	34.1	0.25	218	Prim.	50.0	45.0	Term.	2,300	0	Disc.	Yes	RW
1,900	44.0	1	100	WF	30.0	16.0	Term.	35		Succ.	Yes	
8,500	43.0	0.45	140	WF	38.0		Term.	1,750	0	Disc.	No	FW
10,600	42-45.0	0.46		Prim. WF	63.0		PP 2.83	3,519	357	TETT		P
9,200	35.0	1.14	220	WF								
9,400	34.0		180	WF								
4,500	32.0		100					1,300		TETT	TETT	FW
1,050	21.0	620	80	Prim.	96.0	48.0	Term. 5.86	100	84	Prom.	No	
270-425	33.0	10	65	Prim.	50.0	0.0	Term. 4.86	35	15	Succ.		P (Exp. UL)
900	29.0	35	65	Prim. WF	55.0	40.0	Term. 11.86	80	80	Prom.	Yes	
1,000	14.0	1,600	95	Prim.	64.0	35.0	Term. 3.86	210	140	Succ.	Yes	FW
500	18.0	1,200	75	Prim.	59.0	25.0	Term.	29	0	Disc.	No	P (Exp. UL)
2,200	16.0	90	109	Prim.			Term.	150	50	Disc.	Yes	P (Exp. UL)
5,000	28.0	1.9	105	WF	58.0		Term.	0	0	Succ.		P (Exp. UL)
10,300	37.0	1	180	HC immisc.	33.0	30.0	Term. 1986	5,383		NE		FW
4,300	29.0	6	97	WF						TETT	TETT	
3,000	41.0	0.95	107	WF	37.0	32.0	Term.	4	4	Disc.	No	
3,100	34.4	41.2	100	WF	36.0			5	2	TETT	No	P (Exp. UL)
4,500	32.0	7	110	WF	33.1	21.5	Term. 1.87	0	0	Succ.	Yes	
1,000	35.0	7	70	Prim. WF	40.0	27.1	Term. 12.82	0	0	Disc.	No	P (Exp. UL)
1,000	35.0	7	70	Prim. WF	40.0	25.0	Term. 12.76	0	0	Prom.	No	
4,900	42.0	1.2	130	Prim.	82.0	28.0		50	50	Succ.	Yes	
6,800	43.0	0.323	191	WF	87.0			421	8	NE	TETT	
1,900	45.0	5	68	Prim.	40.0	22.0	Term.	60	200	TETT		
2,900	39.0	3	120	WF	30.0	18.0	Term.	19		Prom.	Yes	P (Exp. UL)
1,040	31.0	16	85	WF	40.0	33.6	Term.	31	0	Disc.	No	P (Exp. UL)
7,500	31.4	2.2	200	Prim.	43.0	10.0	Term.	700	0	Disc.	No	P (Exp. UL)
7,350	43.0	1.2	155	WF	66.0	42.0	Term.	2,521	0	Disc.	Yes	FW
7,100	39.0	1.5	149	WF				290		TETT	TETT	
1,200	42.0	1.7	87	WF			Term.	500		Disc.	No	
7,465	25.0	9	177	WF				14	5	Succ.	Yes	
3,650	39.0	1	140	WF			Term.	1,197	350	Succ.	Yes	
7,100	29.0	6	140	Prim. WF			Term.	83	0	Disc.	No	FW
3,300	26.3	15	95	Prim. WF			Term.	3,593		Disc.	No	FW
5,600	40.0		140	Prim.				480		TETT	Yes	
550	33.0	10	65	Prim.	50.0	50.0	Term. 4.86	20	5	Disc.		P (Exp. UL)
5,200	39.0	2.4	110	WF	50.0		Term.	70		Prom.	Yes	
6,800	26-32.0	1	200	WF	37.5		Term. 12.86				TETT	FW
2,500	17.0	160	118	CO2	55.0	46.0	Term.	450	100	Succ.	Yes	FW

Completed, terminated U.S. projects* — continued

Operator	Field	State	County	Start date	Area, acres	— Number wells — Prod.	Inj.	Pay zone	Formation type	Porosity, %	Permeability, md
Phillips	South Burbank	Okla.	Osage	7-82	720	34	23	Burbank	S	19.5	150
Phillips	Bates Unit	Kan.	Sumner	1-84	640	14	2	Mississippi	LS	15.5	19.7
Phillips	North Burbank	Okla.	Osage	3-83	1,440	48	23	Burbank	S	15.5	50
Phillips	Golden Trend	Okla.	Grady	10-83	720	4	4	Springer	S	9.7	58
Samedan	S. Robertson	Tex.	Gaines	1-81	1,600	56	11	Glorieta Clfk.	Dolo.	7.9	0.5
Samedan	Kuehne Ranch Unit	Wyo.	Campbell	3-81	645	5	2	Minnelusa	S	14.4	52.8
Texaco	Cogdell	Tex.	Kent & Scurry	6-83	15,378	99	126	Canyon Reef Limestone	LS	9.6	5
Texaco	Loudon	Ill.	Fayette	12-84	800	18	13	Weiler	S	21.0	142
Texaco	Levelland	Tex.	Hockley	4-83	3,595	108	37	San Andres	Dolo.	10.0	0.6
Texaco	Robertson North	Tex.	Gaines	9-83	1,400	27	16	Glorieta	Dolo.	7.7	1.54
Texaco	Balko South	Okla.	Beaver City	8-82	1,320	7	3	Kansas City	LS	21.0	0-1,070
Texaco	Cowden North	Tex.	Ector Andrews	12-84	2,440	52	61	Grayburg San Andres	S LS Dolo.	10.1	3.8
Texaco	Mabee	Tex.	Andrews Martin	12-81	13,500	213	230	San Andres	Do.o.	10.5	1.5
Texaco	Jordan	Tex.	Ector & Crane	11-84	1,513	62	30	San Andres	Dolo.	10.5	6
Texaco	Apache Pool	Okla.	Caddo	9-83	1,060	16	8	Bromide	S	13.6	350
Texaco	McElroy	Tex.	Crane Upton	10-81	7,550	504	333	Grayburg San Andres	Dolo.	11.0	5
Texaco	Glenn Pool	Okla.	Creek	1-84	480	16	8	Bartlesville	S	19.5	400
Texaco	Hewitt	Okla.	Carter	3-84	240	9	3	Hoxbar	S	21.0	100
Texaco	Penwell	Tex.	Ector	11-84	4,470	106	36	San Andres	Dolo.	7.8	2.2
Texaco	Ventura	Calif.	Ventura	3-83	800	95	56	C-Block	S	20.0	130
Texaco	Spraberry Deep	Tex.	Dawson	7-83	2,448	15	20	Upper Spraberry Sand	S	17.9	10.6
Texaco	Sho-Vel-Tum	Okla.	Stephens	4-85	3,740	121	20	Sims	S	19.1	190
Texaco	Sho-Vel-Tum	Okla.	Stephens	6-84	150	16	12	Permian	S	25.3	128
Texaco	Harris	Tex.	Gaines	10-83	3,800	83	80	Glorieta	Dolo.	8.6	3
Texaco	Hewitt	Okla.	Carter	7-84	1,200	29	11	Lone Grove	S	18.0	50
Texaco	Flowers	Tex.	Stonewall	8-83	5,876	112	67	Canyon	S	14.7	2
Texaco	Blue Buttes	N. Dak.	McKenzie	12-85	12,770	30	19	Madison	LS	9.6	22
Texaco	Salem	Ill.	Marion	7-82	8,800	330	229	Miss. Devonian	S	10.5-17.9	5-2,200
Texaco	Aneth Unit	Utah	San Juan	9-85	17,000	160	167	Paradox	LS	10.6	18.3
Texaco	Cushing	Okla.	Creek	12-83	480	14	10	Bartlesville	S	17.0	100
Texaco	Dale	Ill.	Hamilton	11-85	4,100	35	4	Aux. Vases	S	14.5	68
Texaco	Vacuum Grayburg-San Andres	N.M.	Lea	4-83	3,046	77	81	Grayburg San Andres	Dolo.	11.6	13
Texaco	Tonti	Ill.	Marion	10-84	285	10	11	Renoist Auxvases McClusky	LS	47.3	358
Texaco	Atlantic	Okla.	Osage	5-85	1,920	35	7	Mississippi Chat Burgess	S	25.0	25
Texaco	Langlie Mattix	N.M.	Lea	2-83	9,360	124	110	Queen Seven Rivers	S	11.4	7.2
Texaco	Spraberry Deep	Tex.	Dawson	7-83	2,368	12	11	Spraberry Lwr. Sand	S	16.3	5.7
Texaco	Sumatra	Mont.	Rosebud	12-84	4,778	18	21	Tyler	S	15.3	48
Unocal	Dollarhide (Clearfork)	Tex.	Andrews	10-85	2,800	57	33	Clearfork	Dolo.	11.6	8.5
Unocal	South Cowden	Tex.	Ector	1-86	1,600	38		Grayburg	Dolo.	8.5	3.1
Unocal	Smyer	Tex.	Hockley	11-84	1,410	72	38	Clearfork	Dolo.	8.3	1-20
Unocal	Orcutt	Calif.	Santa Barbara	6-84	1,680	78	51	Pt. Sal	S	22.5	78
Unocal	North Riley	Tex.	Gaines	2-84	6,720	105	40	Clearfork	Dolo.	7.7	12
Steam											
Angus Petroleum	Blackwell's Corner	Calif.	Kern	1-84	340	25		Agua	S	37.0	475
Chevron	Lost Hills Sec. 32	Calif.	Kern	4-77	120	30	4	Etchegoin Main	S	40.0	62
Chevron	Kern Front	Calif.	Kern	2-80	36	18	9	Chanac	S	29.0	1,000
Chevron	Bradley Canyon	Calif.	Santa Barbara	4-82	40	16	8	Sisquoc	S	30.0	800
Chevron	McKittrick 21Z	Calif.	Kern	9-77	44	19	0	Tulare	S	34.0	1,700
DCR Petroleum	O'Connell Ranch Unit	N.M.	Guadalupe	8-81	12	5		O'Connell	S	20.5	250
DCR Petroleum	T-4 Ranch Unit	N.M.	Guadalupe	10-82	12	3	1	O'Connell	S	20.5	250
Drilling & Production	Midway-Sunset	Calif.	Kern	1965	160	34	20	Monarch	S	22.0	300
Elf Aquitaine	Poso McVan	Calif.	Kern	1980	120	32	19	Etchegoin	S	30-40.0	5,000
Elf Aquitaine	Poso Creek	Calif.	Kern	1980	50	35	19	Etchegoin	S	35.0	1,000
Mobil	Kern Front	Calif.	Kern	10-82	21	10	4	Etchegoin	S	37.0	1,000
Santa Fe Energy	Brea Olinda	Calif.	Orange	10-85	3	4	1	Anaheim	S	27.0	1,000
Shell	Coalinga	Calif.	Fresno	8-84	240	85	12	Temblor Zone I	S		
Shell	Cat Canyon (East)	Calif.	Santa Barbara	8-85	35	7		Brooks Sand	S	30.0	1,400
Shell	Arroyo Grande	Calif.	San Luis Obispo	9-84	208			M2	S	31.0	300
Shell	Coalinga	Calif.	Fresno	1982	57	21	10	Temblor Zone II	S		
Tenneco	Poso Creek	Calif.	Kern	1968	154	14		Etchegoin	S	32.0	2,500
Texaco	South Belridge	Calif.	Kern	1985	20	25	16	Tulare	S	37.0	2,700
Texaco	Poso Creek	Calif.	Kern	3-83	69	26	15	Basal Etchegoin	S	31.0	1,945
Texaco	Cat Canyon	Calif.	Santa Barbara	4-82	80	20	12	S1B	S	35.0	4,500
Texaco	Sour Lake	Tex.	Hardin	4-82	15	5	2	Miocene OB-1	S	32.0	1,500
Texaco	Cat Canyon (East)	Calif.	Santa Barbara	11-77	30	18	3	S16B Thomas Sand	S	31.5	404-1,749
Texaco	Sour Lake	Tex.	Hardin	4-80	2,645	1		Miocene	S	25-36.0	1,600
Texaco	Cat Canyon	Calif.	Santa Barbara	1965	300	12		S8-S16	S	30.0	2,000
Unocal	Santa Maria Valley	Calif.	Santa Barbara	3-81	260	18	0	Pt. Sal	S	27.0	100
Unocal	Guadalupe	Calif.	San Luis	3-81	644	82	12	Sisquoc	S	35.0	1,550
Unocal	McKittrick	Calif.	Kern	12-82	70	25	14	Amnicola	S	37.0	1,500
Unocal	Belridge	Calif.	Kern	10-64	50	6	0	Tulare	S	37.0	2,500
Unocal	North Belridge	Calif.	Kern	8-64	35	6	0	Tulare	S	37.0	2,500
Unocal	Midway-Sunset	Calif.	Kern	1969	80	2		Tulare	S	26.0	300
Unocal	Jesus Maria	Calif.	Santa Barbara	8-82	20	2	0	Monterey	Fract. Chert Dolo.	7.5	2
Unocal	McKittrick	Calif.	Kern	8-71	70	27	0	Tulare	S	37.0	1000-2000

* Data on acreage, wells and production are the most recent reported. They do not necessarily reflect the project's status at termination. † PP = Postponed

Depth, ft	Reservoir oil: Gravity, °API	Reservoir oil: cp	Reservoir oil: °F	Previous prod.	Residual saturation %: Start	Residual saturation %: End	Project status*	Total prod., b/d	Enhanced prod., b/d	Project eval.	Profit	Project scope
2,750	39.0	3	120	WF	41.0	37.0	Term	175		Disc	No	FW
3,700	42.0	0.6	117	WF	50.0	48.0	Term	200		TETT	TETT	FW
2,900	39.0	3	120	WF	48.0	44.0	Term	80		Prom	Yes	FW
9,800	38.0	2.9	155	WF	54.0	53.0	Term	60		TETT	TETT	FW
5,800	34.0	1	107	WF	64.0	NA		2,080		Succ	Yes	FW
7,900	26.0	8	134	Prim. WF				150	10	Succ	Yes	FW
6,800	41.7	0.62	128	WF	28.0	26.0	C	5,022	0	Succ	Yes	FW
1,550	37.0	5	88	WF	21.0	20.0	Term	63	0	Disc	No	FW
4,720	30.5	1.47	107	WF	45.0	44.0	C	2,017	0	Succ	Yes	FW
5,809	30.8	0.67		WF	45.0	44.0	C	1,261	0	Succ	Yes	FW
6,100	40.0	1.8	125	WF	40.0	38.3	C	65	0	Disc	Yes	FW
4,450	34.0	1.63	94	WF	47.0	45.0	Term	499	0	Disc	Yes	P (Exp. UL)
4,700	32.0	2.38	106	WF	43.0	38.0	C	5,007	0	Disc	Yes	FW
3,600	34.0	2.8	95	WF	54.0	53.0	C	677	0	Disc	Yes	FW
3,900	39.0	3.2	96	WF	36.0	25.0	C	578	0	Disc	Yes	FW
3,000	32.0	2.6	95	WF	59.0	37.0	C	6,624	0	Succ	Yes	FW
1,500	37.0	6	90	WF	60.0	48.0	C	90	0	Disc	No	FW
2,600	35.0	8	92	WF	45.0	44.0	C	66	0	Disc	No	FW
3,600	33.0	1.8	95	WF	54.0	53.0	C	1,290	0	Disc	Yes	FW
5,500	30.5	1.3	160	WF			Term 2-86	6,300		TETT	TETT	
6,500	40.6	0.92	103	WF	37.0	34.0	C	231	0	Succ	Yes	FW
4,000-7,000	24-29.0	5	105-135	WF	50.0	47.1	Term	3,179	0	Disc	No	P (Exp. UL)
1,100	28.0	50	90	WF	48.9	47.8	C	227	0	Disc	Yes	FW
5,818	30.8	3.1		WF	45.0	44.0	C	5,912	0	Succ	Yes	FW
4,500	35.0	4	115	WF	54.0	52.0	Term	155	0	Disc	No	P (Exp. UL)
4,200	42.0	1.9	130	WF	40.0	35.0	Term	680	0	Disc	Yes	P (Exp. UL)
9,400	42.0	0.3	240	WF	41.0	40.0	Term	1,427	0	Disc	No	P (Exp. UL)
1,700-3,600	40.0	3-4.4	82-104	WF	27.7	27.5	Term	3,115	300	Succ	Yes	FW
5,300	47.0	0.55	134	WF	52.0	46.0	Term	5,823	0	Disc	Yes	P (Exp. UL)
2,670	41.0	2.5	100	WF	57.0	54.0	C	103	0	Disc	Yes	FW
2,500	36.0	4	100	WF	34.0	31.0	Term	35	0	Disc	No	P (Exp. UL)
4,720	38.0	1.47	105	WF	45.0	44.0	C	6,073	0	Succ	Yes	FW
1,900-2,200	39.5	4	83	WF	30.9	28.5	Term	78	0	Disc	No	FW
2,500	39.0	4	95	WF	34.0	32.0	C	155	0	Disc	No	FW
3,650	35.0	2.8	94	WF	50.7	46.2	C	1,088	0	Succ	Yes	FW
7,100	39.3	0.885	130	WF	42.0	34.0	C	316	0	Succ	Yes	FW
4,900	33.4	4.8	159	WF	29.8	28.7	Term	463	0	Disc	Yes	FW
6,500	37.0	0.56	110	WF	55.5	46.9	Term	1,800	0	Disc	No	P (Exp. UL)
4,500	34.0	3.5	103	Prim. WF	43.6	42.4	Cancelled	720		TETT	TETT	
5,900	27.0	5	112	WF	49.3	43.5	Term	1,100	0	Disc	No	FW
3,750	23.5	8	165	WF	46.0	40.0	Term	1,640	0	Disc	No	FW
6,300	32.0	2.55	104	WF	58.0	48.0	Term	4,300	0	Disc	No	FW
1,300	13.0	4,000	100	Prim.	40.0	15.0	Term		600	TETT	Yes	
1,150	20.0	50	100	Prim.	72.0			138	96			
2,500	12.0	2,300	100	Prim.	50.0	12.0	Term 1986	195	129	Disc	No	FW
3,000	11.0	17,600	120	Prim.	90.0	40.0	Term	70	34	Disc	No	P
1,000	12.0	7,700	97	Prim.	47.0	12.0	PP 9-87	45	45	Disc	No	FW
350	17.0	6,000	70	None	55.0	27.5				TETT	No	
709	17.0	6,000	65	None	50.0	25.0				TETT	No	
1,400	13.0	13.3	90	Prim.			Term	140	30	Prom	Yes	
1,300	16.0	310	95	Prim.				1,000	1,000	Succ	Yes	
1,100	13.0	8,000	105	Prim.	20.0			550	520	No		
1,800	14.0	800	100	Steam soak	67.0	25.0	Term	200	150	Disc	No	P (Exp. UL)
900	13.0	4,000	100	Prim.	55.0	30.0	Term	100	70	Prom	Yes	
1,200	13.0	2,000	95	Prim.				1,800	1,630	Succ	Yes	
3,300	6-10.0	7,000	135	None	68.0		Term			TETT	No	
200-500	15.0	4,000	100	Prim.	63.0	55.0	Term	700	350	TETT	Yes	
1,800	12.0	700	100	Prim.				700	500	Succ	Yes	
2,400	13.0	4,000	100	Prim.	65.0	55.0	Term	170	134	Prom	Yes	
950	14.0	2,340	100	Steam stimulation	58.0	25.0	Term	125		TETT	TETT	
2,000	13.0	1,800	122	Steam stimulation	50.0	20.0	Term	1,250	1,250	Prom	Yes	
2,300	8.0	100,000	110	None			Term 8-86	689	689	Succ	Yes	
500	13.0	1,680	90	Prim.	55.0	22.0	Term 6-86	15	15	Succ	Yes	P (Exp. UL)
2,610	10.4	13-25000	110	Cyclic steam stim.			Term 4-86	378	378	Prom	Yes	
400-2,700	11-24.0			Prim.	53.0	17.0	Term	25	0	Prom	Yes	P (Exp. UL)
3,000	10.0	14,000	130	Prim.			Term	103	103	Succ	Yes	
1,900	12.0	75	110	Prim.	40.0	31.0	Term	140	0	Disc	No	P (Exp. UL)
3,000	9.0	580	85	Cyclic	65.0	61.0	Term	1,900	200	Disc	No	P (Exp. UL)
1,100	11.3	300	180	Steam soak	60.0	39.0	Term	290	0	Succ	Yes	FW
740	13.7	450	130	Prim.	62.0	41.0	Term	25	0	Succ	Yes	FW
770	13.6	450	130	Prim.	59.0	40.0	Term	25	0	Succ	Yes	FW
1,900	14.0	700	106	Prim.	50.0	35.0	Term	5	0	Disc	No	P (Exp. UL)
3,500	9.0	20,000	110	Prim.	60.0	45.0	Term	0	0	Disc	No	P (Exp. UL)
1,200	13.0	700	150	Steam soak	55.0	35.0	Term	160	0	Succ	Yes	FW

Royal Dutch/Shell said the main factors influencing gas developments include availability and location of reserves, whether supplies are indigenous or have to be imported, price competitiveness of gas in its market sectors, governmental energy policies, climatic conditions, environmental concerns, technological advances, and overall levels of energy demand and prices.

World natural gas net production* **Table 1**

	1973	1979	1985	1986	1987
			(Tcf/year)		
U.S.	21.04	19.04	16.00	15.04	15.32
Canada	2.60	2.75	2.79	2.57	2.75
Mexico	0.43	0.89	0.93	0.93	1.00
North America	**24.07**	**22.68**	**19.71**	**18.54**	**19.07**
South America	**0.89**	**1.14**	**1.64**	**1.71**	**1.75**
Netherlands	2.29	3.00	2.46	2.25	2.29
U.K.	1.04	1.39	1.46	1.57	1.69
Norway	0.00	0.78	0.96	0.96	1.04
Others	1.46	1.43	1.36	1.36	1.50
Western Europe	**4.79**	**6.61**	**6.25**	**6.14**	**6.50**
Indonesia	0.04	0.50	1.11	1.14	1.21
Others	0.61	1.11	2.14	2.32	2.50
Asia/Far East/Australasia	**0.64**	**1.61**	**3.25**	**3.46**	**3.71**
Algeria	0.14	0.68	1.11	1.04	1.29
Others	1.25	1.75	1.96	2.18	2.50
Africa/Middle East	**1.39**	**2.43**	**3.07**	**3.22**	**3.79**
U.S.S.R.	7.39	14.14	22.32	24.14	25.64
Romania	1.00	1.04	1.25	1.25	1.25
Others	0.75	1.14	1.19	1.21	1.21
U.S.S.R./East Europe/China	**9.14**	**16.32**	**24.75**	**26.61**	**28.11**
World	**40.89**	**50.89**	**58.75**	**59.64**	**63.04**

*Excludes reinjected/flared gas and shrinkage due to extraction of NGLs. Totals may not add due to rounding.

Source: Royal Dutch/Shell Gourp

U.S. markets

In the U.S., there is no consensus on future demand levels.

The Energy Modeling Forum believes gas prices will begin to reverse their decline by 1990, reflecting the elimination of excess deliverability. After 1990, gas prices will rise continuously, reflecting higher oil prices and smaller field size and higher exploration/development costs of future reserve additions.

By 2000, inflation adjusted gas prices will reach their peaks of the early 1980s, even with lower oil prices.

Expected industrial gas demand by 2010 is 4-8 tcf/year, depending on future oil price levels. Much of the variation stems from fuel switching and different assumptions about the penetration of new industrial gas fired technologies.

The range in future demand by electric utilities also is large—from 2.9 tcf to 5.7 tcf by 2010—depending upon assumptions about environmental regulations, fuel prices, and load growth.

In the short term, said Royal Dutch/Shell, many large producers expect sales to continue to fall due to a tightening of supply, continued fierce gas-to-gas and interfuel competition, and increased utilization efficiency.

However, others, including some large producers, take a more optimistic view of future demand. They foresee a steady increase.

Whatever the outcome, substantial supplies will be needed from reserves yet to be discovered and developed in the Lower 48 to supplement declining production from known reserves.

Prospects for alternative supplies from, for example, LNG projects, Alaska, or non-conventinal gas sources will depend not only on how supply/demand evolves but also on whether marketable prices can be achieved that would make such sources economic.

The potential for significant increases in imports from Canada of gas surplus to local requirements also will depend on economic considerations and the construction of additional transportation capacity.

West Europe diversity

In West Europe, the situation is complicated by the diversity of the gas markets in various European countries.

Environmental concerns have already resulted in tighter legislation in many European countries, a move which is likely to benefit gas in commercial and industrial applications.

It is anticipated that the trend towards higher penetration in the public distribution sector will continue in many countries. In some countries there may also be an increase in gas use for electricity generation stimulated by concerns about nuclear safety and the introduction of combined cycle and cogeneration power plants.

On the supply side, currently contracted supplies will begin to decline during the 1990s. A committed supply/demand deficit will develop that can be covered to some extent by the offtake flexibility available in existing contracts.

Some existing contracts may be renewed or extended, although the availability of reserves to maintain current indigenous production levels in some countries and to extend existing export contracts for Dutch gas could be a constraint. Other exporters—the U.S.S.R., Norway, and Algeria—all have the potential to increase gas exports from large reserves bases, subject to commercial, political, economic, strategic, and other considerations.

The U.S.S.R. has sufficient reserves to increase its exports, but current supplies to some European countries are already at, or close to, the limits set by these countries for non-OECD gas imports. Similar constraints would apply to Algerian gas in certain countries.

Supplies from the Norwegian sector of the North Sea, additional to those already contracted from Troll and Sleipner fields and after allowing for option volumes, are potentially available longer term.

Nigeria has substantial gas reserves. Progress is being made to develop an LNG project aimed at markets of the Atlantic basin for start up in the mid-1990s.

Scandinavia growth

Development of new gas markets in Scandinavia and southern Italy, Portugal, Greece, and Turkey is underway or firmly planned.

Scandinavia's markets are being actively pursued.

Renewed interest in selling gas to Scandinavian countries has been sparked by Sweden's decision to phase out its extensive nuclear power program by 2010.

North Sea gas from Norway and Siberian gas from the Soviet Union are candidates to meet Swedish demand that could rise to 500 MMcfd by 2010 from the current 62 MMcfd if the country maintains its nuclear phaseout policy.

Gas currently plays a minor role in Sweden's total energy supply. A small network in southern Sweden is served by a pipeline from Denmark. First supplies were available in 1985 under a contract with Dansk Olie og Naturgas, Denmark's

World natural gas consumption — **Table 2**

	1973	1979	1985	1986	1987
			(Tcf/year)		
U.S.	21.50	19.93	17.07	15.64	16.21
Canada	1.60	1.75	1.93	1.71	1.71
Mexico	0.46	0.89	0.93	0.93	0.93
North America	**23.57**	**22.57**	**19.93**	**18.29**	**18.86**
South America	**0.89**	**1.14**	**1.64**	**1.71**	**1.86**
Netherlands	1.21	1.39	1.29	1.36	1.39
U.K.	1.04	1.68	1.93	1.96	2.04
Germany	1.14	1.89	1.75	1.64	1.89
Italy	0.57	0.96	1.14	1.21	1.39
France	0.57	0.89	1.04	1.00	1.07
Others	0.50	0.75	0.86	0.82	0.93
Western Europe	**5.04**	**7.57**	**8.00**	**8.00**	**8.71**
Asia/Far East/Australasia	**0.57**	**1.68**	**3.32**	**3.64**	**3.86**
Africa/Middle East	**0.96**	**1.50**	**2.25**	**2.36**	**2.61**
U.S.S.R.	7.50	12.86	20.11	21.29	22.50
Others	1.89	2.89	3.64	4.07	4.64
U.S.S.R./East Europe/China	**9.39**	**15.75**	**23.75**	**25.36**	**27.14**
World*	**40.36**	**50.36**	**58.93**	**59.46**	**63.04**

*Totals may not add due to rounding.

Source: Royal Dutch/Shell Gourp

World natural gas reserves — **Table 3**

	Tcf/year
North America	288.5
Europe	196.9
Pacific	60.6
Total OECD	**546.0**
Latin America	
OPEC	63.0
Non-OPEC	132.3
Total Latin America	**195.3**
Africa	
OPEC	174.7
Non-OPEC	26.4
Total Africa	**201.1**
Middle East	
OPEC	904.8
Non-OPEC	19.2
Total Middle East	**924.0**
Asia Pacific	
OPEC	49.4
Non-OPEC	128.7
CPEs	30.0
Total Asia Pacific	**208.1**
U.S.S.R./Eastern Europe	**1,565.8**
Total	**3,640.3**

Source: Jensen Associates Inc. estimates based on Oil & Gas Journal, Cedigaz, and selected national reports.

state gas company, to supply 222 bcf of gas.

The contract has been extended, and Sweden is importing 62 MMcfd although the system could handle imports of about 195 MMcfd.

By the early 1990s Sweden's gas consumption could rise to 96-145 MMcfd. And if all its nuclear power stations were replaced by gas burning capacity, without energy conservation measures or development of other fuels, the gas load would be about 450 MMcfd.

Sweden does not want a single source for new supplies and is negotiating with Norway and the Soviet Union for 115 MMcfd from each country to meet increased demand prior to the nuclear phaseout. Soviet gas would be delivered through Finland, where a distribution network is under construction by Neste Oy.

Neste Oy, Finland's state energy company, is buying about 135 MMcfd from the Soviet Union and is under contract to step up the flow to 230 MMcfd by the mid-1990s.

Norway is anxious to pursue export opportunities offered by the Swedish market. But its marketing efforts cannot move into top gear without more information from Sweden and formulation of a gas policy by the Norwegian government.

The main objective of the policy would be to provide guidelines for integrating potentially high cost gas fired power generations into the low cost national power grid.

Soviet, Japanese work

The U.S.S.R. is working to boost production to more than 30 tcf/year by 1990 and exceed 35 tcf/year in the 1990s.

Because most of its gas reserves lie in remote regions of western Siberia, long pipelines are required—more than 30,000 miles in the current 5 year plan that ends in 1990.

Gas production in other areas of the country has stabilized, so up to the end of the current century western Siberian gas will be the only source of the increase of gas supply for the national economy, to export, and compensate for the decrease of gas production in the mature regions.

Among the main problems facing the Soviet gas industry is commercial operation of its three supergiant gas fields. The main increase of gas production in the near term will be attained in Yamburg field, where the yield in 1990 will be brought to 4 bcf/year.

In Japan, demand is expected to grow, albeit at a somewhat slower rate than during the 1970s and early 1980s.

Demand for LNG for electricity generation will be limited by the modest growth expected in electricity demand and by competition from nuclear energy and coal.

New LNG supplies from the Australian North West Shelf project is scheduled to begin this year and, assuming that existing contracts that expire during the 1990s are extended, a supply gap for additional LNG is anticipated from the mid-1990s.

The gap is expected to be filled mainly by the expansion of certain existing projects, which have uncommitted reserves, although the introduction of one or two new suppliers remains a possibility.

Technology to help

Technological developments will influence gas demand and improve the cost effectiveness of bringing uncommitted gas reserves to market.

In some cases, technological developments will improve the efficiency and/or competitiveness of gas compared to other fuels. Examples include the use of gas to fuel combined cycle gas turbines for electricity generation that offer significant improvements in thermal efficiency.

Gas utilization developments are expected to result in increased use of gas for powering air conditioning equipment, while new burners designed to produce very low emissions for industrial and domestic applications are becoming available. Compressed natural gas is already used in several countries as an automotive fuel. Others are investigating its potential.

Conversion of gas to liquid hydrocarbons is an important and commercially attractive opportunity for used gas that might otherwise be difficult to develop. Proven technology is now available to produce a range of transportation fuels. In New Zealand, locally produced gas has been converted into gasoline for some years.

There also are a number of plants using gas to produce methanol and various petrochemicals. PE

Table 1

Breakout of world LNG shipments

	1983	1984	1985	1986	1987
	Trillion BTU				
EXPORTERS					
Abu Dhabi	90	105	108	108	104
Algeria	555	461	443	432	482
Brunei	266	259	252	252	256
Indonesia	483	698	738	738	763
Libya	32	40	43	33	29
Malaysia	61	173	209	245	292
U.S.	50	50	50	50	47
Total	**1,537**	**1,786**	**1,843**	**1,858**	**1,973**
Percent of world gas production	**2.8**	**2.9**	**3.0**	**2.9**	**2.9**

	1983	1984	1985	1986	1987	Percent of natural gas consumption 1983	1987
	Trillion BTU						
IMPORTERS							
Belgium	58	54	84	93	97	17	28
France	324	324	277	277	320	36	32
Italy	0	14	14	0	0	0	0
Spain	86	72	86	90	90	86	87
West Germany	0	0	0	4	4	0	*
Japan	950	1,286	1,357	1,390	1,444	93	98
Korea	0	0	0	4	18	0	*
U.S.	119	36	25	0	0	*	0
Total	**1,537**	**1,786**	**1,843**	**1,858**	**1,973**		

*Less than 0.5%.

Source: American Gas Association from British Petroleum Co. plc data

But new supplies from Qatar, Canada, and Alaska may seek roles in the Japanese market.

"Japan may insist on a lower price in the future, essentially decoupling natural gas prices from the expected high oil price at the turn of the century."

A report compiled by British Petroleum from International Energy Agency data shows that the cif cost of Japan's LNG imports peaked at $5.80 (U.S.)/MMBTU in 1981, then slipped to $3.10/MMBTU in first quarter 1987, the latest period for which figures were available.

Among selected fuels, only crude oil cif in IEA countries hit a higher peak: $6.60/MMBTU, also in 1981.

Japan's Natural Resources & Energy Agency predicted in December 1987 that LNG costs will rise sharply, compared with coal and nuclear power, by 2000. As a result, nuclear plants will remain the cheapest means of electrical power generation.

The agency assumed that crude oil and equivalent LNG prices will jump to $30-40/bbl in 2000 from $18.50 late in 1987, while coal and nuclear fuel costs will rise 1-3%/year.

When NREA issued its report, nuclear power generating costs worked out to 9 yen (7¢ U.S.)/kw-hr. Corresponding costs were 10-11 yen (8-9¢)/kw-hr for power generated with coal as fuel, 11-12 yen (9-9.5¢) with fuel oil or LNG, and 13 yen (10¢) with hydroelectric power.

Norwegian frontiers eyed for LNG supply

Saga Petroleum AS and other operators were assessing the outlook for a pioneering LNG project as 1989 drew near.

Gas supply source would be the Haltenbanken region of the Norwegian Sea off mid-Norway, a frontier region in which industry has drilled several discoveries. There is no production there.

An earlier study, submitted in March 1987 by a combine of Total-CFP and state owned Statoil to Norway's Petroleum and Energy Ministry, found that LNG exports were a viable option for development of gas found in the Tromsoflaket region, another frontier, off northern Norway.

Saga's Midgard gas field, its 1981 discovery, would be the pillar in any gas development on Haltenbanken, the company said.

The region's first two fields earmarked for development, Heidrun and Draugen, will produce oil and associated gas. Midgard could produce 70-500 bcf/year of gas.

Saga pegged Midgard recoverable reserves at 4.2 tcf out of an estimated 5.5 tcf in place, making the field by far the largest gas reservoir found so far on Haltenbanken. Because of excellent reservoir properties, Saga expected excellent, flexible gas deliverabilities. Saga also expects to recover 110 million bbl of condensate.

Saga was searching for a gas buyer as 1989 approached and said the field can be on stream about 4 years after partners and Norwegian authorities approve the project. Expected start-up of production is 1994-95.

Gas would move by pipeline over iceberg scoured seabottom to shore. It would be used domestically and exported via LNG tankers and other pipelines.

Saga's partners in Midgard field are Agip SpA, ARCO Norway Inc., Deminex (Norge) AS, Norsk Hydro AS, Norske Shell AS, and Den norske stats oljeselskap AS.

Draugen and Heidrun associated gas may be reinjected for several years while a total gas solution for the mid-Norway offshore region is established.

Saga estimated the cost of a 280 bcf/year gas trunk line from the offshore fields to a mid-Norway onshore terminal at $415 million. The terminal would cost $340-850 million, depending on fractionation capacity.

Base gas volumes will depend on markets being served. Probable volumes are 150-200 bcf/year, but Haltenbanken fields are easily capable of producing more than 350 bcf/year.

From the mid-Norway terminal, dry gas would be transported to market by one of three methods: to eastern Norway and Sweden via pipeline, to continental Europe and the U.K. through a connecting pipeline to the existing North Sea gas pipeline grid, or to Europe and the U.S. as LNG.

A link to the North Sea grid would require a pipeline of about 250 miles from the terminal and cost $500-600 million, depending on capacity and distance.

With such a connection, Haltenbanken gas could be shipped to Emden, West Germany, Zeebrugge, Belgium, and St. Fergus, Scotland.

Depending on production volume, investment in a gas liquefaction plant would be $690 million to $1.3 billion.

Saga's studies showed reasonable distances to several LNG receiving terminals, with those at Zeebrugge, Belgium, Montoir de Bretagne, France, and Cove Point in the U.S. considered the most suitable alternatives.

Total-Statoil's study of the Tromsoflaket region found that development could begin in the 1990s, aiming for LNG sales of 5 billion cu m/year from an onshore liquefaction plant to markets in the U.S. and western Europe. Additional gas could provide fuel for power generation.

The study envisioned a floating production system tied to subsea completions beginning in Snohvit field. Gas could move ashore through a 140 km, 28 in. pipeline to a two train liquefaction plant.

Project costs would amount to about $3 billion in 1987 U.S. dollars: $1.3 billion for field development and pipeline construction, $900,000 to $1 billion for the liquefaction plant, and at least $750,000 for five LNG tankers.

Extension approved for U.S. LNG shipments

In North America's only LNG export project, Phillips 66

Prices in the industry

Crude oil prices

$/bbl

Year	U.S. refiner acquisition cost: Domestic	Imported	Composite	U.S. landed cost of imports: Total	Selected countries: Canada	Mexico	United Kingdom	Nigeria	Saudi Arabia	Venezuela	Average export prices: Worldwide	OPEC	Non-OPEC
1976	8.84	13.48	10.89	13.34	13.57	NA	NA	13.80	13.04	11.80	NA	NA	NA
1977	9.55	14.53	11.96	14.31	14.21	13.75	NA	15.25	13.61	13.13	NA	NA	NA
1978	10.61	14.57	12.46	14.38	14.50	13.54	NA	14.86	13.92	12.83	NA	NA	NA
1979	14.27	21.67	17.72	21.65	20.43	20.86	22.16	22.96	19.15	18.18	NA	NA	NA
1980	24.29	33.89	28.07	33.95	30.47	31.80	35.88	37.05	30.02	25.86	NA	NA	NA
1981	34.93	37.05	35.24	36.52	32.16	33.78	37.24	39.70	34.19	29.87	34.81	34.42	36.16
1982	31.22	33.55	31.87	33.18	26.92	26.64	34.28	36.17	35.00	24.82	33.33	33.71	32.3
1983	28.87	29.30	28.99	28.93	25.63	25.78	30.87	30.84	29.76	22.94	29.66	29.89	29.13
1984	28.53	28.88	28.63	28.46	26.59	26.87	29.60	30.50	29.50	25.15	28.60	28.61	28.6
1985	26.66	26.99	25.75	26.66	25.71	25.63	28.35	28.96	24.72	24.43	27.60	28.00	26.98
1986	14.82	14.00	14.55	13.49	13.43	12.17	14.63	15.29	12.84	11.52	14.98	15.45	14.21
1987	17.76	18.13	17.90	17.65	17.04	16.69	18.78	19.32	16.81	15.76	17.41	17.31	17.57

From: Oil & Gas Journal Energy Database
Source: U.S. Department of Energy

Petroleum product prices

¢/gallon

Year	Motor Gasoline-Pump Price: Leaded Regular	Unleaded Regular	Unleaded Premium	Average All-Types	Heating Oil Residential	Refiner Resale (Wholesale) Product Prices: Motor Gasoline	Aviation Gasoline	Kerosene Jet Fuel	Kerosene	No. 2 Fuel Oil	No. 2 Diesel Oil	Propane	Resid
1978	62.60	67.00	NA	65.20	49.00	43.40	53.70	38.60	37.23	35.66	36.50	23.70	23.00
1979	85.70	90.30	NA	88.20	70.40	63.70	72.10	66.00	56.60	54.47	57.40	29.10	33.63
1980	119.10	124.50	NA	122.10	97.40	94.10	112.80	86.80	80.26	78.21	80.10	41.50	44.43
1981	131.10	137.80	147.00	135.30	119.40	106.40	125.00	101.20	101.03	97.20	97.20	46.60	61.17
1982	122.20	129.60	141.50	128.10	116.00	97.30	122.80	95.30	97.18	91.95	91.40	42.70	57.80
1983	115.70	124.10	138.30	122.50	107.80	88.20	117.80	85.40	85.12	80.05	80.80	48.40	57.30
1984	112.90	121.20	136.60	119.80	109.10	83.20	116.50	83.00	84.75	79.62	80.30	45.00	59.14
1985	111.50	120.20	134.00	119.60	105.30	83.50	113.00	79.40	81.69	76.66	77.20	39.80	56.41
1986	85.70	92.70	108.50	93.10	83.60	53.10	91.20	49.50	49.92	44.91	45.20	29.00	36.23
1987	89.70	94.80	109.30	95.70	80.30	58.90	85.90	53.80	56.75	52.25	53.40	25.20	45.36

From: Oil & Gas Journal Energy Database
Source: U.S. Department of Energy

Comparative energy prices

Year	Natural gas delivered to consumers ($/MCF): Residential	Commercial	Industrial	Electric Utilities	Average	Cost of fossil fuels delivered to utilities (Cents/Million BTU): Coal	Heavy oil	Natural gas	All fuels	Electricity retail prices (Cents/Kilowatt Hour): Residential	Commercial	Industrial	Total
1973	1.29	0.94	0.50	0.38	0.68	40.5	78.5	33.8	47.6	2.54	2.41	1.25	1.96
1974	1.46	1.07	0.67	0.51	0.84	70.9	189.0	48.2	91.4	3.10	3.04	1.69	2.49
1975	1.71	1.35	0.96	0.77	1.12	81.4	200.5	75.2	104.4	3.51	3.45	2.07	2.92
1976	1.98	1.64	1.24	0.98	1.37	84.8	195.2	103.4	111.9	3.73	3.69	2.21	3.09
1977	2.35	2.04	1.50	1.32	1.66	94.7	219.8	129.1	129.7	4.05	4.09	2.50	3.42
1978	2.56	2.23	1.70	1.48	1.85	111.6	212.5	142.2	141.1	4.31	4.36	2.79	3.69
1979	2.98	2.73	1.99	1.81	2.21	122.4	298.8	174.9	163.9	4.64	4.68	3.05	3.99
1980	3.68	3.39	2.56	2.27	2.80	135.1	426.7	219.9	192.8	5.36	5.48	3.69	4.73
1981	4.29	4.00	3.14	2.89	3.39	153.2	533.4	280.5	225.6	6.20	6.29	4.29	5.46
1982	5.17	4.82	3.87	3.48	4.15	164.70	483.0	337.6	224.9	6.86	6.86	4.95	6.13
1983	6.06	5.59	4.18	3.58	4.82	165.60	457.0	347.4	220.6	7.18	7.01	4.97	6.29
1984	6.12	5.55	4.22	3.70	4.85	166.40	481.0	358.3	219.2	7.54	7.33	5.04	6.52
1985	6.12	5.50	3.95	3.55	4.72	164.8	424.4	343.1	209.6	7.79	7.47	5.16	6.71
1986	5.83	5.08	3.23	2.43	4.13	157.9	240.1	234.4	175.0	7.41	7.13	4.90	6.42
1987	5.54	4.78	2.94	2.32	4.05	150.6	297.6	223.5	170.7	7.41	7.00	4.72	6.32

From Oil & Gas Journal Energy Database
Source: U.S. Department of Energy

Price history, crude oil, natural gas and motor gasoline

	Actual current prices						Inflation adjusted real prices				
	Crude oil			Natural gas			Crude oil			Natural Gas	
Year	U.S. average wellhead $/bbl	West Texas Intermediate posted $/bbl	Motor Gasoline leaded pump price	U.S. average wellhead $/Mcf	Consumer average $/Mcf	Producer Price index 1982-100	U.S. average wellhead $/BBL	West Texas Intermediate posted $/BBL	Motor Gasoline Leaded pump price $/Gal	U.S. average wellhead $/Mcf	Consumer average $/Mcf
1925	1.68	1.79	0.222	0.094	0.223	17.8	9.438	10.056	1.247	0.528	1.253
1926	1.88	1.90	0.234	0.095	0.229	17.2	10.930	11.047	1.359	0.552	1.311
1927	1.30	1.28	0.211	0.088	0.220	16.5	7.879	7.758	1.278	0.533	1.333
1928	1.17	1.36	0.209	0.089	0.232	16.7	7.006	8.144	1.254	0.533	1.389
1929	1.27	1.45	0.214	0.082	0.216	16.4	7.744	8.841	1.306	0.500	1.317
1930	1.19	0.95	0.200	0.076	0.214	14.9	7.987	6.376	1.339	0.510	1.436
1931	0.65	0.77	0.170	0.070	0.233	12.6	5.159	6.111	1.348	0.556	1.849
1932	0.87	0.69	0.179	0.064	0.247	11.2	7.768	6.161	1.601	0.571	2.205
1933	0.67	1.00	0.178	0.062	0.237	11.4	5.877	8.772	1.563	0.544	2.079
1934	1.00	1.00	0.189	0.060	0.223	12.9	7.752	7.752	1.461	0.465	1.729
1935	0.97	1.00	0.188	0.058	0.224	13.8	7.029	7.246	1.365	0.420	1.623
1936	1.09	1.10	0.195	0.055	0.220	13.9	7.842	7.914	1.399	0.396	1.583
1937	1.18	1.22	0.200	0.051	0.220	14.9	7.919	8.188	1.342	0.342	1.477
1938	1.13	1.02	0.195	0.049	0.218	13.5	8.370	7.556	1.445	0.363	1.615
1939	1.02	1.02	0.188	0.049	0.216	13.3	7.669	7.699	1.410	0.368	1.624
1940	1.02	1.02	0.184	0.045	0.217	13.5	7.556	7.556	1.364	0.333	1.607
1941	1.14	1.17	0.192	0.049	0.221	15.1	7.550	7.748	1.274	0.325	1.464
1942	1.19	1.17	0.204	0.051	0.227	17.0	7.000	6.882	1.202	0.300	1.335
1943	1.20	1.17	0.205	0.052	0.223	17.8	6.742	6.573	1.153	0.292	1.253
1944	1.21	1.17	0.206	0.051	0.215	17.9	6.760	6.536	1.150	0.285	1.201
1945	1.22	1.17	0.205	0.049	0.214	18.2	6.703	6.429	1.126	0.269	1.176
1946	1.41	1.36	0.208	0.053	0.220	20.8	6.779	6.524	0.999	0.255	1.058
1947	1.93	1.84	0.231	0.060	0.232	25.6	7.539	7.188	0.903	0.234	0.906
1948	2.60	2.57	0.259	0.065	0.241	27.7	9.386	9.278	0.934	0.235	0.870
1949	2.54	2.57	0.268	0.063	0.254	26.3	9.658	9.772	1.019	0.240	0.966
1950	2.51	2.57	0.268	0.065	0.266	27.3	9.194	9.414	0.980	0.238	0.974
1951	2.53	2.57	0.272	0.073	0.298	30.4	8.322	8.454	0.893	0.240	0.980
1952	2.53	2.57	0.276	0.078	0.332	29.6	8.547	8.682	0.931	0.264	1.122
1953	2.68	2.72	0.287	0.092	0.355	29.2	9.178	9.298	0.983	0.315	1.216
1954	2.78	2.82	0.290	0.101	0.381	29.3	9.488	9.625	0.991	0.345	1.300
1955	2.77	2.82	0.291	0.104	0.400	29.3	9.454	9.625	0.992	0.355	1.365
1956	2.79	2.82	0.299	0.108	0.415	30.3	9.208	9.307	0.988	0.356	1.370
1957	3.09	3.04	0.310	0.113	0.431	31.2	9.904	9.753	0.992	0.362	1.381
1958	3.01	3.06	0.304	0.119	0.462	31.6	9.525	9.677	0.961	0.377	1.462
1959	2.90	2.98	0.305	0.129	0.477	31.7	9.148	9.385	0.962	0.407	1.505
1960	2.88	2.97	0.311	0.140	0.500	31.7	9.085	9.369	0.982	0.442	1.577
1961	2.89	2.97	0.308	0.151	0.510	31.6	9.146	9.399	0.973	0.478	1.614
1962	2.90	2.97	0.306	0.155	0.514	31.7	9.148	9.369	0.967	0.489	1.621
1963	2.89	2.97	0.304	0.158	0.512	31.6	9.146	9.399	0.963	0.500	1.620
1964	2.88	2.95	0.304	0.154	0.519	31.6	9.114	9.320	0.962	0.487	1.642
1965	2.86	2.92	0.312	0.156	0.522	32.3	8.854	9.040	0.966	0.483	1.616
1966	2.88	2.94	0.321	0.157	0.523	33.3	8.649	8.817	0.964	0.471	1.571
1967	2.92	3.03	0.332	0.160	0.520	33.4	8.743	9.060	0.994	0.479	1.557
1968	2.94	3.07	0.337	0.164	0.504	34.2	8.596	8.977	0.985	0.480	1.474
1969	3.09	3.30	0.348	0.167	0.515	35.6	8.680	9.256	0.978	0.469	1.447
1970	3.18	3.35	0.357	0.171	0.550	36.9	8.618	9.079	0.967	0.463	1.491
1971	3.39	3.56	0.364	0.182	0.590	38.0	8.921	9.368	0.958	0.479	1.553
1972	3.39	3.56	0.361	0.186	0.630	39.8	8.518	8.945	0.907	0.467	1.583
1973	3.89	3.87	0.388	0.216	0.680	45.0	8.644	8.604	0.862	0.480	1.511
1974	6.74	10.37	0.532	0.304	0.840	53.5	12.598	19.383	0.994	0.568	1.570
1975	7.56	11.16	0.567	0.445	1.120	58.4	12.945	19.110	0.971	0.762	1.918
1976	8.14	12.65	0.590	0.580	1.370	61.1	13.322	20.704	0.966	0.949	2.242
1977	8.57	14.30	0.622	0.790	1.660	64.9	13.205	22.034	0.958	1.217	2.558
1978	8.96	14.85	0.626	0.905	1.850	69.9	12.818	21.245	0.896	1.295	2.647
1979	12.51	22.40	0.857	1.178	2.210	78.7	15.896	28.463	1.089	1.497	2.808
1980	21.59	37.37	1.191	1.590	2.800	89.7	24.069	41.661	1.328	1.773	3.122
1981	31.77	36.67	1.311	1.980	3.390	98.0	32.418	37.418	1.338	2.020	3.459
1982	28.52	32.75	1.222	2.460	4.150	100.0	28.520	32.750	1.222	2.460	4.150
1983	26.19	30.25	1.157	2.590	4.820	101.2	25.879	29.891	1.143	2.559	4.763
1984	25.88	29.83	1.129	2.660	4.850	103.6	24.981	28.793	1.090	2.568	4.681
1985	24.09	28.08	1.115	2.510	4.720	103.1	23.366	27.236	1.081	2.435	4.578
1986	12.51	16.44	0.857	1.940	4.130	100.1	12.498	16.421	0.856	1.938	4.046
1987	15.40	18.21	0.897	1.670	4.050	102.8	14.981	17.714	0.873	1.625	3.940

From: Oil and Gas Journal Energy Database
Source: U.S. Department of Energy

Non-Communist pipeline construction in 1989 and beyond*

Area	4-10 in.	12-20 in.	22-30 in.	30+ in.	Total
	Miles				
GAS PIPELINES					
U.S.	746	2,559	3,653	2,326	9,284
Canada	1,655	1,939	1,660	2,979	8,233
Latin America	806	314	629	666	2,415
Asia-Pacific	690	953	914	1,775	4,332
West Europe	1,119	640	438	910	3,107
Middle East	0	0	0	0	0
Afrida	48	8	350	584	990
Total gas	5,064	6,413	7,644	9,240	28,361
CRUDE PIPELINES					
U.S.	240	61	267	525	1,093
Canada	136	12	0	0	148
Latin America	9	70	67	165	311
Asia-Pacific	20	23	0	409	452
West Europe	13	78	73	0	164
Middle East	0	0	56	820	876
Africa	0	0	26	239	265
Total crude	418	244	489	2,158	3,309
PRODUCT PIPELINES					
U.S.	549	968	0	0	1,517
Canada	78	35	00	0	113
Latin America	110	731	0	0	841
Asia-Pacific	40	0	150	0	190
West Europe	36	15	0	0	51
Middle East	0	0	0	34	34
Africa	0	309	0	0	309
Total product	813	2,058	150	34	3,055
NON-COMMUNIST WORLD TOTALS					
Gas	5,064	6,413	7,644	9,240	28,361
Crude	418	244	489	2,158	3,309
Product	813	2,058	150	34	3,055
Total	6,295	8,715	8,283	11,432	34,725

*Projects planned and under way in 1989 and scheduled for completion beyond 1989.

increase transmission capacity to U.S. markets because current import levels are at capacity of the transmission system (OGJ, Dec. 5, 1988, p. 14).

The Free Trade Agreement between Canada and the U.S. will prompt additional Canadian gas imports into the U.S. As a result, pipeline operators are scrambling to gain permits for proposed projects (OGJ, Feb. 6, p. 21; Jan. 16, p. 20).

Major proposed Canadian gas-pipeline projects which have been on back burners for some time are being looked at again.

The Polar Gas Project, which would involve 1,318 miles of 36-in. pipe, is one of several proposals to bring gas from the Mackenzie Delta and Beaufort Sea area to Alberta. And there is the 330-mile, 10-in. Vancouver Island pipeline project.

U.S., Canada leaders

That U.S. gas-pipeline construction was heating up was evident by mid 1988. For the year ending June 30, 1988, more than 5,000 miles of interstate gas pipeline had been proposed to the U.S. Federal Energy Regulatory Commission (FERC).

This represented a jump of more than 4,200 miles (323%) over mileage (1,304) for projects in the previous 12-month period. Of the 129 land projects proposed in that period ending June 30, 94 were for sites in states ranging northeast from West Virginia and Pennsylvania.

Moreover, during the FERC's "open season" on pipeline proposals to transport gas from the Mobile Bay (Ala.) area for interconnection with major gas-transmission systems or new markets in Florida, 15 projects were proposed. Four others were already on file.

Most of the planned gas-pipeline construction in the U.S. involves pipe larger than 10 in. in diameter.

Three gas-line projects emerged from the FERC's open season for applications to serve the U.S. Northeast (OGJ, Jan. 30, p. 31). Two of the three projects would mainly serve as U.S. legs of Canadian pipeline expansions.

In the competion to provide gas supply to California's thermal-EOR market, the FERC earlier this year issued final certificates authorizing construction of several proposals. The line that is the most successful in lining up shippers will likely be built first.

The Gulf of Mexico gas-pipeline competition involves transmission of supply from the Jurassic Norphlet deep gas trend off Alabama, Mississippi, and Florida. One major line has already been built.

In Western Europe meanwhile, almost 4,500 miles of new gas line are planned, mainly involving small and large-diameter pipe.

The largest West Europe project involves 515 miles of 38-in. pipe from Statoil's (den Norske Stats Oljeselskap AS) Zeepipe-Sleipner project in the North Sea to a terminal at the Belgian port of Zeebrugge. Project completion is expected by late 1994.

In Asia, Australia's Queensland government is planning 330 miles of 12.2-in. line to connect Surat basin and Denison Trough gas fields.

Bangladesh Oil, Gas & Minerals Corp. is designing a 117-mile, 20-in. line from Kailashtila to Ashanganj.

India's National Gas & Pipelines Corp. has laid 1,094 miles of 18-36 in. line from Bombay High to six fertilizer plants.

Sui Gas Transmission CL is designing a 182-mile, 20-in. loop of the Pakistan gas line from Sui to Karachi.

Flat crude, product plans

Planned crude-oil pipeline construction mileage for 1989 and beyond is 36% less than what was reported a year ago.

The biggest drop occurs in the U.S. and Latin America. Part of the reason for the decline is completion of the first leg of the All American Pipeline in the U.S. and a major line linking a new supply region in Colombia.

Most of the non-Communist world's planned crude-line construction in 1989 and beyond is in the U.S. and the Middle East, mainly Iraq. The U.S. planned mileage accounts for 33% of the total planned in the non-Communist world.

In the U.S., the largest project involves completion of All America Pipeline which currently ends near McCamey in far West Texas. Planned are 525 miles of 30-in. pipe to extend the line to Webster, Tex., just south of Houston. Completion is scheduled in 1990.

Another major U.S. project is the Angeles Pipeline, which involves 130 miles of 30-in. pipe from Emidio, Calif., to Los Angeles-basin refineries. Completion is scheduled in mid-1992.

Middle East lines, meanwhile, include a 602-mile system of 48-56 in. pipe from Iraq to an export terminal near Yanbu, Saudi Arabia, and 62.5 miles of 42-in. pipe in Iran from Gurreh to Taheri.

The planned Middle East projects account for most of the non-Communist world's large-diameter crude-pipeline construction.

In Africa, Sonatrach Inc. is laying 239 miles of 34-in. loops on a crude line from Hooud el Hanra to Skikda.

In Mexico, Petroleos Mexicanos is laying 164.7 miles of 48-in. line from near Nuevo Teapa, Ver., to Salina Cruz, Oax.

Planned product-line construction in 1989 and beyond is

flat compared to estimates made a year earlier.

The U.S. and Latin America account for most of the product lines planned in the non-Communist world.

The biggest product line in the U.S. is a 310-mile, 10-12-in. pipeline that Koch Industries Inc. is building from Rosemount, Minn., to Milwaukee.

Chevron Pipeline Co. is laying 123 miles of 10-in., 52 miles of 12-in., and 20 miles of 8-in. pipe from Sour Lake, Tex., to Fort Worth in addition to its Mesquite Products Pipeline along the same route.

In Latin America, meanwhile, Petroleo Brasileiro SA is laying 180 miles of 16-in. pipe in Brazil from Guararema to Volta Redonda, and Corpoven SA is laying a 373-mile system in Venezuela from Puerto la Cruz refineries to Maturin, San Tome, Ciudad Bolivar, Puerto Ordaz, and Puerto Ayacucho.

In Africa, Nigerian National Petroleum Corp. is designing a 309-mile system of 16 and 12-in. pipe from Port Harcourt, Enugu, and Auchi to Benin City.

Construction costs

More good news for the prospective hike in gas-line activity is that construction costs over the past few years have moderated their rates of increase. For the 12-month period ending June 30, 1988, U.S. FERC data show construction costs in $/mile actually declined over the same period a year earlier.

Estimated costs for all land projects proposed to the Commission averaged $657,388/mile, down barely 0.07% from a year earlier. Proposed offshore projects averaged $755,345/mile, off by less than 1% from the same period a year earlier.

The following cost projections for planned mileage for 1989 and for 1989 and beyond assume that 90% of all construction will be land and 10% offshore. The exceptions are for pipelines 32 in. in diameter or larger, which are assumed to be solely land projects.

Here is a breakout of cost projections:

- Total land construction for 1989 will reach $5.6 billion—$1.9 billion for 4-10 in. pipelines, $2.2 billion for 12-20 in. pipelines, $645 million for 22-30 in. pipelines, and $778 million for 32-in. pipelines and larger.
- Total construction offshore for 1989 will reach $614 million—$252.3 million for 4-10 in. pipelines, $279.5 million for 12-20 in. pipelines, and $82.3 million for 22-30 in. pipelines.
- Total land construction for 1989 and beyond will reach $21.3 billion—$3.7 billion for 4-10 in. pipelines, $5.2 billion for 12-20 in. pipelines, $4.9 billion for 22-30 in. pipelines, and $7.5 billion for pipelines greater than 32 in. in diameter.
- Total construction offshore for 1989 and beyond will reach $1.7 billion—$476 million for 4-10 in. pipelines, $659 million for 12-20 in. pipelines, and $625.4 million for 22-30 in. pipelines.

Company doldrums

The possibility of increased gas-pipeline construction activity--with its implicit promise of increased demand--comes as good news to battered U.S. gas-pipeline operating companies.

Latest available annual-report data for all regulated U.S. interstate petroleum and natural-gas pipelines show that revenues and incomes of gas-pipeline companies took another beating in 1987 as both major and nonmajor natural-gas companies continued to struggle with the industry restructuring wrought by FERC Order 436.

Major gas-pipeline companies are those whose combined gas sold for resale and gas transported or stored for a fee exceeded 50 bcf at 14.73 psi (60° F.) in each of the 3 previous calendar years.

U.S. interstate pipeline mileage

Year	Miles		
	Gas	Liquid	Total
1978	258,576	162,452	421,028
1979	264,134	169,794	433,928
1980	274,248	172,673	446,921
1981	274,634	172,815	447,449
1982	286,999	172,549	459,548
1983	285,204	167,819	453,023
1984	*258,379	173,922	*432,301
1985	*279,395	171,401	*450,796
1986	*281,881	170,014	*451,895
1987	*280,085	167,865	*447,950

Source: FERC Form 6 Annual Reports—oil pipelines; Forms 2 & 2A—gas pipelines.

*Reflects operating mileage as reported under the FERC's classification system for natural-gas pipeline companies effective beginning with the 1984 reporting year. Only major gas-pipeline companies are required to file mileage.

Nonmajors are companies not classified as majors and having had total gas sales of volume transactions exceeding 200 MMcf at 14.73 psi (60° F.) in each of the 3 previous calendar years.

The intent of Order 436 when issued in 1985, and of subsequent orders, was to bring greater competition to the interstate transportation of natural gas. The effect, combined with lingering low real (as opposed to projected) demand for gas, has been to squeeze operating-companies' revenues and incomes.

Revenues and incomes for natural-gas pipeline companies in 1987 continued their steep declines of recent years.

Major gas-pipeline companies' operating revenues for 1987 fell $6 billion (-20.3%) with incomes off $232.5 million.

All natural-gas pipeline companies' revenues for 1987 were off even more, by $8.6 billion (21.3%); all companies' incomes were down $324.2 million (-19.6).

For all natural-gas pipeline companies, net income as a portion of gas-plant investment continued its slide of recent years, falling to 2.7% in 1987 from 3.4% in 1986, 4.5% in 1985, and 8.7% in 1984.

For major gas pipelines, net income as a portion of gas-plant investment mirrored the trend, falling to 2.6% from 3.2% in 1986, 4.3% in 1985, and 7.6% in 1984.

For 1987, all gas companies reported an industry gas-plant investment totaling more than $49.9 billion compared with $49.4 billion for 1986 and $48.3 billion for 1985.

Majors' gas-plant investment in 1987 fell to slightly less than $42 billion from $42.2 billion for 1986.

Similarly, operating revenues for liquids-pipeline companies dropped by $229.8 million (-3.15%). Their incomes, however, showed a significant increase, up $423.7 million (20.6%).

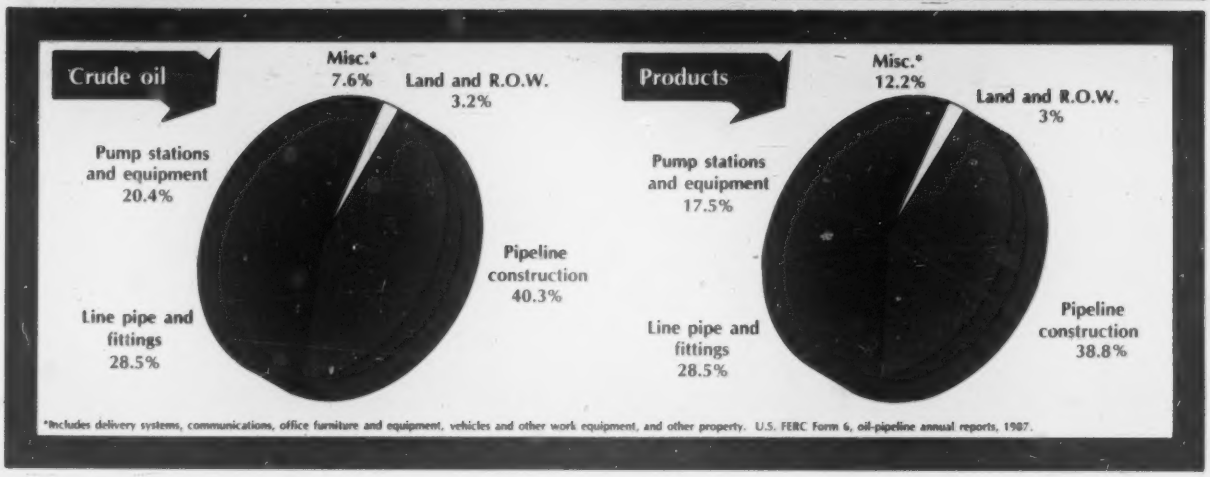
For interstate common-carrier liquids-pipeline companies, net income as a percentage of investment in carrier property was 11.6% in 1987 compared with 9.2% in 1986, 11.3% in 1985, and 13.1% in 1984.

Liquids pipelines' investment in carrier property for 1987 fell by almost $22.4 million (-4.96%) to slightly less than $22.3 billion compared with $22.4 billion in 1986, $21.6 billion in 1985, and $19.4 billion in 1984.

Another measure of the profitability of oil and natural-gas pipeline companies in recent years is reflected in the percentage net income represents of operating income. Trends for liquids-pipeline companies and for natural-gas pipeline companies have been heading in opposite directions for the past 10 years.

For liquids-pipeline companies in 1987, this figure rose to

Liquid-pipeline investment



*Includes delivery systems, communications, office furniture and equipment, vehicles and other work equipment, and other property. U.S. FERC Form 6, oil-pipeline annual reports, 1987.

35% from 28% in 1986 and 21.9% in 1978. The figure for 1986 represents the only year the percentage has declined (from 32.6% for 1985).

By contrast for all natural-gas pipeline companies, income as a percentage of operating revenues has been steadily falling in the past 10 years.

At the end of 1987, it stood at slightly more than 4%, fractionally higher than for 1986 but continuing the downward trend since 1978 when it was 8.3%.

U.S. interstate network

Mileage operated by the 264 liquids and natural-gas pipeline companies reporting to the FERC for 1987 also fell. Total mileage was reported at 447,950, off 3,945 miles (0.9%).

Crude-oil and products pipeline companies operated 167,865 miles of gathering and trunk line in 1987, down 2,119 miles (-1.3%). This mileage handled crude oil, crude-oil products, and NGL's.

The decline is entirely made up of drops in product-line mileage.

Mileage for all natural-gas pipeline companies increased fractionally; mileage for major gas-pipeline companies fell, also fractionally.

For any year, however, comparisons of U.S. petroleum and natural-gas pipeline mileages must be done with care for two reasons:

- The number of companies required to file reports with the FERC varies each year.
- Secondly, the FERC's system for classifying interstate natural-gas pipeline companies changed beginning with the 1984 reporting year, as explained previously.

One effect of this change has been that companies classified as nonmajor are exempt from filing certain data, chief among them being mileage and gas-sales or transportation figures. Many companies nonetheless file such data voluntarily. Figures for these nonmajor companies should be excluded from a calculation of total U.S. interstate pipeline utilization for any given year because of their unreliability year to year.

Therefore, combining 1987 mileage data for all regulated liquids-pipeline companies (167,865) with mileage reported by the major natural-gas pipeline companies (42 companies reporting 252,447 miles) yields a total figure of 420,312. This represents less than 1% decrease of 3,343 miles over comparable figures reported for 1986 (170,014 + 253,641 = 423,655). This compares with a similarly small change for 1986 over 1985, a drop of only 156 miles for all liquids and major natural-gas pipelines.

At the end of 1987, reports from liquids-pipeline companies show a total of 35,055 miles of gathering lines, 54,886 miles of crude-oil trunk lines, and 79,924 miles of products pipelines. For liquids-pipeline companies, the criterion determining which company must file an annual report (Form 6) is whether the FERC classifies the company as an interstate common-carrier pipeline.

These reports for 1986 show that gathering lines increased by 846 miles (2.5%) and crude lines, by 733 miles (1.4%) over totals reported for 1986. Products lines decreased by 3,728 miles (-4.6%).

These figures reverse patterns evident in figures reported for 1986 compared with those for 1985 and is in line with the erratic pattern of liquids-pipeline utilization for the previous 7 years. Natural-gas transmission lines were down over 1986 by 3,084 miles (-1.5%) for all companies and by 3,697 miles (-2%) for major companies. Field lines for all companies showed a fractional increase of 47 miles but fell among major companies, by 792 miles.

For all companies as well as majors, storage lines increased in 1987 over 1986: up 3,552 miles (61.7%) for all companies and 3,295 miles (65%) for majors.

Deliveries rise

Throughput for liquids-pipeline companies in 1987 showed a very slight gain over 1986.

Natural-gas pipelines sales fell again in 1987, by 1.9 tcf (-23.6%) for majors and by almost 2.2 tcf (-22.8%) for all companies. For 1987, all regulated U.S. interstate gas pipelines carried 13.5 tcf of gas for others; majors carried nearly 12.9 tcf of that.

Volumes of gas transported for others by all gas-pipeline companies comprised almost 65% of the total volume of gas (20.8 tcf) that moved through U.S. interstate systems in 1987. For major companies (whose total volumes were just shy of 19.2 tcf), the share was a bit larger: slightly more than 67%. Crude-oil and product deliveries in 1987 again exceeded 11 billion bbl, an increase over 1986 of 112 million bbl, or only about 1%.

Crude-oil deliveries actually fell in 1987 by 8.8 million bbl or less than 1%. Product deliveries, reflecting increased U.S. refinery utilization, rose by 200.8 million bbl (4.3%).

Trunkline traffic for U.S. crude-oil and product pipelines

Investment in liquids pipelines

	Company and investment, $						
	A	B	C	D	E	Total, $	%
CRUDE PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	1,787,499	814,497	292,759	979,827	1,189,920	5,064,502	0.30
Right of way	12,169,423	1,004,094	316,392	16,516,482	15,068,015	45,074,406	2.71
Line pipe	134,882,674	25,700,801	7,797,471	96,144,263	153,364,612	417,889,821	25.15
Line pipe fittings	9,490,351	922,085	1,387,778	17,401,123	27,527,324	56,728,661	3.41
Pipeline construction	189,654,709	27,801,794	10,931,879	219,879,456	222,164,700	670,432,538	40.34
Buildings	21,184,793	4,951,147	2,457,791	13,566,759	9,918,148	52,078,638	3.13
Boilers	—	—	—	—	—	—	—
Pumping equipment	24,302,627	5,524,747	2,414,882	17,169,861	48,657,207	98,069,324	5.90
Machine tools and machinery	—	—	—	33,140	—	33,140	—
Other station equipment	89,380,146	21,330,115	4,593,316	45,152,887	29,575,598	190,032,062	11.44
Oil tanks	14,494,825	6,038,119	5,678,530	16,653,577	26,446,336	69,311,387	4.17
Delivery facilities	—	—	5,327,265	1,494,974	6,819,985	13,642,224	0.82
Communications systems	710,337	3,225,009	68,631	10,506,049	3,382,127	17,892,153	1.08
Office furniture and equipment	1,689,985	221,313	215,058	1,727,360	891,704	4,745,420	0.29
Vehicles and other work equip.	7,519,510	786,939	515,392	5,852,776	243,243	14,917,860	0.90
Other property	—	1,203,646	—	—	4,659,326	5,862,972	0.35
Total	**$507,266,879**	**$99,524,306**	**$41,997,144**	**$463,078,534**	**$549,908,245**	**$1,661,775,106**	***100.00**
PRODUCT PIPELINES INVESTMENT BY FIVE COMPANIES							
Land	4,095,422	1,763,961	532,035	936,527	3,241,861	10,569,806	0.37
Right of way	28,739,531	10,829,964	20,111,183	8,776,412	6,750,443	75,207,533	2.60
Line pipe	340,532,482	67,590,647	108,516,930	87,679,163	97,788,462	702,107,684	24.29
Line pipe fittings	72,088,338	12,874,224	15,611,443	1,704,032	20,932,923	123,210,960	4.26
Pipeline construction	566,607,912	109,220,477	206,225,286	102,019,195	137,781,102	1,121,853,972	38.81
Buildings	23,930,483	4,026,100	4,997,792	10,566,018	17,617,962	61,138,355	2.11
Boilers	—	—	—	—	—	—	—
Pumping equipment	45,782,626	6,160,023	31,921,749	28,220,704	24,012,357	136,097,459	4.71
Machine tools and machinery	—	—	—	—	363,318	363,318	0.01
Other station equipment	119,871,056	21,184,953	39,746,989	23,304,697	105,543,108	309,650,803	10.71
Oil tanks	48,805,418	17,220,724	9,035,479	17,465,781	51,130,650	143,658,052	4.97
Delivery facilities	—	—	9,594,441	10,811,906	45,787,494	66,193,841	2.29
Communication systems	1,269,854	369,627	2,239,628	8,742,968	—	12,622,077	0.44
Office furniture and equipment	10,248,198	2,374,190	2,468,937	618,384	773,120	16,482,829	0.57
Vehicles and other work equip.	5,498,272	1,809,909	7,911,262	2,235,838	2,041,276	19,496,548	0.67
Other property	72,979,021	—	19,089,144	—	—	92,068,165	3.18
Total	**$1,340,448,613**	**$255,424,799**	**$478,002,298**	**$303,081,625**	**$513,764,067**	**$2,890,721,402**	***100.00**

Source: U.S. FERC Form 6, Annual Report of Oil Pipeline Companies, Dec. 31, 1987.

* Actual total may be inexact due to rounding.

was flat in 1987, advancing by only 33 billion bbl-miles (0.96%) over that for 1986. Crude-oil trunkline traffic increased by a modest 18.7 billion bbl-miles (2%). Product traffic fell by 5 billion bbl-miles (0.3%).

Construction costs

The costs of line pipe and fittings and of laying pipelines make up roughly 70% of the cost of a pipeline system. These elements of pipeline construction costs have risen very little for the past few years, after rapidly increasing before 1982. The average cost per mile for any given diameter may fluctuate from one year to the next as projects' costs are affected by geographic location, terrain, population density, or other factors. Cost-per-mile figures may reveal more about cost trends than aggregate costs.

For proposed U.S. gas-pipeline projects for the 12-month period ending June 30, 1988, the average land cost per mile was $657,388/mile, compared with $707,253/mile for the 1986-87 period, an insignificant decrease of less than 1%.

For offshore projects, the 1987-88 figure was $755,345/mile, compared with $825,395/mile for 1986-87, a decline of 8.5%. Combined land and offshore projects show an average cost of $664,509/mile for this year's coverage; for the 1986-87 period, the figure was $707,634/mile.

Analyses of the four major categories of pipeline construction costs--material, labor, right-of-way and damages, and miscellaneous--can also indicate trends within each group.

"Miscellaneous" generally includes engineering, supervision, contingencies, allowances for funds used during construction, administration and overheads, and FERC filing fees.

For the 132 projects surveyed for the 1987-88 period, cost-per-mile data for the four categories are as follows:

- Material--Land, $217,079/mile; offshore, $377,663/mile; total, $228,753/mile.
- Labor--Land, $281,637/mile; offshore, $209,634/mile; total, $276,402/mile.
- R.O.W. and damages--Land, $40,213/mile; offshore, $12/mile; total, $37,290/mile.
- Miscellaneous--Land, $118,459/mile; offshore, $168,036/mile; total, $122,064/mile.

Average cost per mile for the projects providing these data shows no clear trend related to either length or geographic area.

In general, however, the cost per mile within a given diameter indicates that the longer the pipeline, the lower the cost per mile for construction. Nonetheless, road, highway, and river crossings and marshy or rocky terrain each strongly affects pipeline construction costs.

Compressor-station costs make up another major cost element of natural-gas pipelines. FERC applications for these projects cover the same 12-month period as for pipelines. Costs for new land compressor stations range from a low of $126/hp for a 750-hp station in Texas to a high of $4,347/hp for a 1,000-hp station in New York. Cost-per-

Natural-gas pipeline transmission expenses*

	Expenses, $		Cost/mile, $		Cost/MMcf sold, $	
	1985-majors†	1986-majors§	1985-majors†	1986-majors§	1985-majors†	1986-majors§
Operation expenses						
Supervision and engineering	141,111,223	159,699,942	534.15	629.59	12.46	20.43
System control and load dispatching	28,003,796	28,679,686	106.00	113.07	2.47	3.67
Communication system expenses	25,198,795	28,265,422	95.39	111.43	2.22	3.62
Compressor station labor and expenses	241,167,595	239,180,275	912.90	942.93	21.29	30.60
Gas for compressor station fuel	748,735,039	532,572,604	2,834.21	2,099.59	66.09	68.14
Other fuel and power for compressor stations	62,883,011	46,066,937	238.03	181.61	5.55	5.89
Mains	194,353,906	182,900,300	735.69	721.06	17.16	23.40
Measuring and regulating station expenses	70,192,395	62,517,614	265.70	246.47	6.20	8.00
Tranmission and compression of gas by others	1,472,161,326	1,267,266,607	5,572.61	4,996.01	129.95	162.13
Other transmission expenses	47,009,813	36,206,154	177.95	142.74	4.15	4.63
Rents	17,089,546	17,142,978	64.69	67.68	1.51	2.18
Total operation expenses	**3,047,906,445**	**2,597,098,519**	**11,537.32**	**10,238.66**	**269.05**	**332.27**
Maintenance expenses						
Supervision and engineering	38,445,814	35,545,963	145.57	140.14	3.39	4.55
Structures and improvements	26,126,983	30,638,479	98.90	120.79	2.31	3.92
Mains	90,064,519	93,717,959	340.92	369.47	7.95	11.99
Compressor station equipment	174,091,227	197,872,245	658.99	780.08	15.37	25.32
Measuring and regulating station equipment	13,635,384	12,539,338	51.61	49.43	1.20	1.60
Communication equipment	13,164,377	13,913,234	49.83	54.85	1.16	1.78
Other equipment	4,216,143	3,138,461	15.96	12.37	0.37	0.40
Total maintenance expenses	**359,754,497**	**387,365,679**	**1,361.78**	**1,527.13**	**31.76**	**49.56**
Total transmission expenses	**$3,407,660,942**	**$2,984,446,198**	**$12,899.10**	**$11,765.79**	**$300.80**	**$381.83**
Total miles of transmission pipeline	**264,178**	**253,656**				
Total natural gas sold, MMcf	**11,328,495**	**7,816,259**				

Source: Statistics of Interstate Natural Gas Pipeline Companies—1985 & 1986. U.S. Department of Energy. *U.S. interstate pipelines for calendar years 1985 & 1986. †45 of 137 companies filing Form 2's or 2A's with the U.S. Federal Energy Regulatory Commission; majors are companies whose combined gas sold for resale and gas transported or stored for a fee exceed 50 bcf (at 14.7 psi; 60°F.) in each of the 3 previous calendar years. §44 of 135 companies filing Form 2's and 2A's with the U.S. FERC for 1986; majors defined in previous note and in U.S. FERC Accounting and Reporting Requirements for Natural Gas Companies, para. 20-011, effective Feb. 2, 1985, beginning with the 1984 reporting year.

horsepower figures show no particular correlation with compressor-station size or location.

Operating costs

Once a natural-gas pipeline is laid and compressor stations constructed, operating costs become the next consideration.

As an aid in estimating this element, transmission expenses for interstate gas pipelines for 1985 and 1986, the latest period for which data are available, are given below.

The data are based on 264,178 miles of pipeline operated and 11,328,495 MMcf sold for 1985 majors and on 253,656 miles of pipeline operated and 7,816,259 MMcf of gas sold for 1986 majors. These represent the most recently available data.

- The highest component of transmission-operating expenses is transmission and compression of gas by others: for majors in 1985, this component was $5,573/mile or $130/MMcf; for majors in 1986, this component was $4,996/mile or $1[illegible]/MMcf.
- The second highest cost component of transmission-operating expense is gas for compressor-station fuel: for majors in 1985, $2,834/mile or $66/MMcf; for majors in 1986, $2,100/mile or $68/MMcf.
- The highest cost component of maintenance expense covers compressor-station equipment: for majors in 1985, $659/mile or $15/MMcf; for majors in 1986, $780/mile or $25/MMcf.
- The second highest cost component for maintenance is the maintenance of pipelines: for 1985 majors, $341/mile or $8/MMcf; for 1986 majors, $369/mile or $12/MMcf.
- The highest component of transmission expenses for natural-gas pipelines is the operation expense: for 1985 majors, $11,537/mile or $269/MMcf; for 1986 majors, $10,239/mile or $332/MMcf.
- Unit-maintenance expenses for 1985 majors were $1,362/mile or $32/MMcf; for 1986 majors, $1,527/mile or $59/MMcf.
- During 1985, major natural-gas pipeline companies spent almost $3,048 million for operation expenses and nearly $360 million on maintenance. Total expenditures by 1986 majors for operation and maintenance expenses reached more than $3,407 million. Total operation expenses for majors in 1986 fell to slightly more than $2,597 million, a drop of almost $451 million (off a sharp 14.8%).

Total maintenance expenses in 1986, on the other hand, rose to more than $387 million, an increase of almost $28 million (7.7%). Total transmission expenses nonetheless showed a decline between 1985 and 1986. In the latter year, they reached only slightly more than $2,984 million, a drop from 1985 of a little more than $423 million (down a noticeable 12.4%).

- On a unit basis, the total 1985 transmission expense for majors was $12,899/mile or $300/mmcf; for 1986, $11,766/mile or $382/MMcf of gas sold.

Refinery throughputs

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
					(Thousand barrels daily)						
U.S.	14,625	14,780	14,465	13,520	12,470	11,775	11,685	12,045	12,005	12,715	12,855
Canada	1,805	1,820	1,960	2,085	1,945	1,650	1,545	1,570	1,495	1,475	1,605
Latin America	5,715	5,975	6,220	6,460	6,575	6,080	5,825	5,715	5,450	5,480	5,530
Western Europe	12,775	12,855	13,665	12,330	10,970	10,075	9,710	9,790	9,490	10,060	9,795
Middle East	2,240	2,535	2,365	2,445	2,205	2,245	2,515	2,665	2,795	2,950	2,970
Africa	1,165	1,280	1,355	1,460	1,525	1,735	1,920	1,975	2,015	2,095	2,170
Japan	4,285	4,240	4,340	4,015	3,630	3,360	3,255	3,355	3,120	2,990	2,910
Southeast Asia	2,030	2,330	2,450	2,370	2,480	2,335	2,380	2,455	2,650	2,765	2,750
South Asia	605	645	675	705	795	840	880	885	1,020	1,120	1,145
Australasia	680	690	700	640	655	625	605	615	580	590	570
Total Non-Communist	**45,925**	**47,150**	**48,195**	**46,030**	**43,250**	**40,720**	**40,320**	**41,070**	**40,620**	**42,240**	**42,300**
Communist	11,930	12,875	13,230	13,320	13,420	13,575	13,675	13,885	14,165	14,500	14,700
Total World	**57,855**	**60,025**	**61,425**	**59,350**	**56,670**	**54,295**	**53,995**	**54,955**	**54,785**	**56,740**	**57,000**

Source: British Petroleum

Historical reserve data (billion bbl oil)

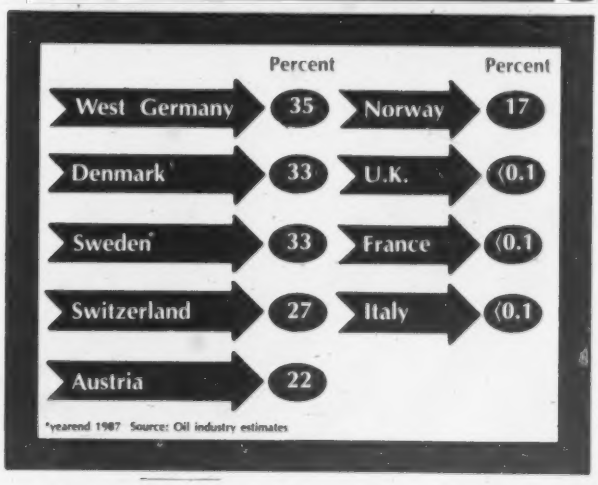
	1960	1965	1970	1975	1980	1985	1988	1989
Asia-Pacific								
Australia	—	—	2.0	1.7	2.4	1.4	1.7	1.7
Brunei	—	—	1.0	2.0	1.7	1.4	1.4	1.4
India	—	—	—	—	2.5	3.5	4.3	6.4
Indonesia	9.5	9.5	10.0	14.0	9.5	8.6	8.4	8.2
Malaysia	—	—	—	2.5	3.0	3.0	2.9	2.9
Europe								
Norway	—	—	1.0	7.0	5.5	8.3	14.8	10.4
United Kingdom	—	—	1.0	16.0	14.8	13.6	5.2	5.2
Middle East								
Abu Dhabi	—	10.0	11.8	29.5	29.0	30.5	92.2	92.2
Divided Zone	6.0	12.4	25.7	6.4	6.0	5.4	5.2	5.2
Dubai	—	—	—	1.0	1.4	1.4	4.0	4.0
Iran	35.0	40.0	70.0	64.5	57.5	48.5	92.8	92.8
Iraq	27.0	25.0	32.0	34.3	30.0	44.5	100.0	100.0
Kuwait	62.0	62.0	67.1	68.0	64.9	90.0	91.9	91.9
Oman	—	—	—	5.0	2.3	3.5	4.0	4.0
Qatar	2.5	3.0	3.5	5.8	3.6	3.4	3.2	3.1
Saudi Arabia	50.0	60.0	128.5	148.6	165.0	169.0	166.9	169.9
Syria	1.0	1.0	1.0	1.0	1.3	1.4	1.7	1.7
Africa								
Algeria	5.2	7.4	7.0	7.4	8.2	9.0	8.5	8.4
Angola-Cabinda	—	—	—	1.3	1.2	1.8	1.1	2.0
Egypt	—	2.0	4.5	3.9	2.9	3.2	4.3	4.3
Gabon	—	—	—	—	—	—	0.6	0.7
Libya	2.0	10.0	29.2	26.0	23.0	21.1	21.0	22.0
Nigeria	—	3.0	9.3	20.2	16.7	16.7	16.0	16.0
Tunisia	—	—	—	1.0	1.7	1.5	1.8	1.8
Western Hemisphere								
Argentina	2.2	1.9	4.5	2.5	2.5	2.3	2.3	2.3
Brazil	—	—	—	—	1.3	1.9	2.3	2.5
Canada	—	7.5	10.7	7.1	6.4	7.1	6.8	6.8
Colombia	—	1.5	1.7	1.7	1.0	0.624	1.6	2.0
Ecuador	—	—	—	2.5	1.1	1.4	1.6	1.4
Mexico	2.3	2.5	3.2	9.5	44.0	48.6	48.6	54.1
Venezuela	18.5	17.3	14.0	17.7	17.9	25.8	56.3	58.0
U.S.A.	33.5	35.4	37.0	33.0	26.4	27.3	25.3	26.5
Total Non-Communist	**268.5**	**319.6**	**511.4**	**555.7**	**562.2**	**614.6**	**808.1**	**823.6**
U.S.S.R.	33.5	33.5	77.0	80.4	63.0	63.0	59.0	58.5
China	—	—	—	—	—	19.1	18.4	23.6
Other	—	—	—	—	—	—	1.8	1.7
Total World	**302.0**	**353.1**	**611.4**	**658.7**	**648.5**	**698.7**	**887.3**	907.4

A sample of U.S. companies' downstream profits — Table 1

	Refining/marketing				Petrochemicals			
	2nd quarter		1st half		2nd quarter		1st half	
	1988	1987	1988	1987	1988	1987	1988	1987
	Million $							
Amoco	206	55	312	50	189	104	358	192
ARCO*	72	45	159	70	226	101	411	186
Chevron	123	24	322	8	76	67	185	119
Citgo	34	17	76	71	—	—	—	—
Coastal	21.3	26.7	29.9	39.8	—	—	—	—
Crown Central	7.2	(3)	7.6	(18.3)	—	—	—	—
Diamond Shamrock R&M	1.9	2.2	7.1	4.9	—	—	—	—
Exxon	281	19	712	55	314	225	622	411
Kerr-McGee	1.8	4.6	16	10	18.4	7.7	27.7	16.3
Mobil	260	84	477	162	160	75	294	118
Occidental†	—	—	—	—	221	51	339	212
Pacific Resources	8	2	24.2	4.7	—	—	—	—
Phillips	98	48	172	78	237	110	430	205
Shell	103	56	233	64	133	101	275	141
Sun	79	21	121	16	—	—	—	—
Texaco	215	18	368	24	44	19	91	27
Tosco	36.8	10.6	50.2	21.9	—	—	—	—
Unocal	28	19	63	43	17	19	27	29
Valero	5.8	(7.3)	10.5	(13.3)	—	—	—	—
Vista§	—	—	—	—	27.8	15.7	87.7	35.5
Total	**1,581.8**	**441.8**	**3,163.2**	**691**	**1,663.2**	**895.4**	**3,147.4**	**1,691.8**

* Petrochemical earnings represent ARCO's 80.4% interest in ARCO Chemical Co. and Lyondell Petrochemical Co., which entails a large refinery and petrochemical complex in Houston. †Includes earnings from Cain Chemical Co. as of May 2. §Fiscal 1988 third quarter and 9 months.

Unleaded market shares* 5



earnings.

Refining/marketing profits were up for almost all U.S. companies during 1988 (see table 1). Chevron Corp., for instance, recorded the highest margins in 2 years because of lower crude costs and reductions in processing and marketing costs. Chevron's results were limited, however, by $48 million of additions to reserves for environmental programs.

Chevron implemented a wide range of measures that involve recycling waste heat to process units, such as a boiler feedwater circulation system that collects heat formerly rejected by cooling towers. Plant improvements, such as one new refinery cogeneration unit that saves about $30 million/year, or about $0.35/bbl at the refinery, have contributed to Chevron's improved profitability.

Improved product demand, especially for high-octane gasoline, contributed to improved profits for Amoco Oil Co. Amoco's first half product sales volume rose to 1.04 million b/d from 978,000 b/d during 1987. Its first half product sales was up 3% from 1987 figures.

Mobil Oil Corp. saw a 2% increase in motor gasoline sales, and a 17% rise in lubricant sales.

U.S. refiners have also increased emphasis on lubricant markets. Exxon Corp., for instance, introduced a new marine lubricant to replace older marine lube types. It also developed new engine oil additives intended to meet new industry-wide lube oil quality specifications introduced in the U.S. and Europe.

Retail lube sales was also an increasing market in 1988. Pennzoil Products Co. and Jiffy Lube International signed a long-term contract in 1988 to make Pennzoil the oil of choice at Jiffy Lube's outlets.

Refiners in the European Economic Community saw a substantial recovery in margins during 1988. Meager first-quarter margins rose considerably during the second and third quarters partially because of strong gasoline demand in the U.S.

Margins were helped greatly by the return to market related pricing by producer/exporters in their efforts to expand crude oil sales. Most Middle Eastern crudes now trade on a realization basis with North Sea Brent crude prices setting the pace.

European margins increased from about $1/bbl during the first quarter to about $2.15/bbl in the second quarter, and $2.25/bbl during the third quarter.

North American refining capacity grew by about 1.2% to about 17.7 million b/d. Throughput for the region rose 1.1% to about 12.9 million b/d in the U.S. and rose 8.8% to 1.6 million b.d in Canada (see table 2 and Fig. 2).

Western Europe still leads surplus

Western Europe still leads the world in surplus refining capacity, despite a capacity decline in 1987. Capacity in the region stood at 14.01 million b/d in 1987, down 2.2% from 1986.

Refinery throughput dropped to about 9.8 million b/d, down 2.6%. Capacity as of Jan. 1, 1988 stood at 11.84 million b/d for the 12 nations making up the European Economic Community.

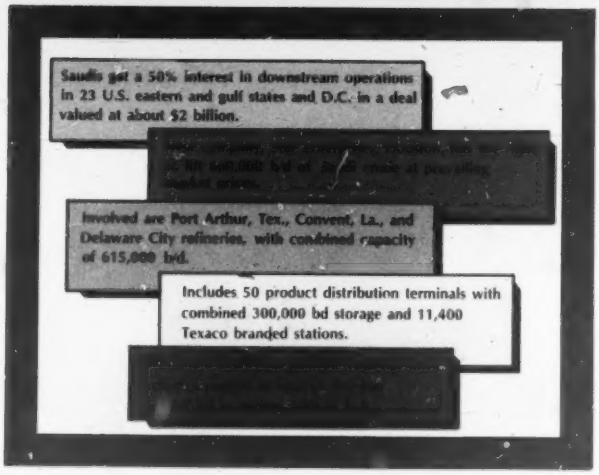
Japan's throughput fell 2.7% to 2.91 million b/d, and capacity fell 4.3% to about 4.5 million b/d. Australian throughput fell 3.4% to 570,000 b/d, and capacity there dropped 1.9% to 730,000 b/d.

Middle East capacity rose 6.9% to 4.12 million b/d, while throughput was up about 0.7% to 2.97 million b/d. Capacity increases in Saudi Arabia were 22% to 1.375 million b/d.

U.S. demand for distillate, residual fuel oil, and gas is expected to be up for the 1988-1989 heating season because of continued economic growth and low product prices (see Fig. 3). The supply of liquid fuels to meet the winter surge in demand now comes from increased refining output, imports, and stocks. In the past, refiners met demand mainly from inventories.

Demand for distillates is expected to be up about 3.3%

Highlights of the Texaco-Saudi deal


Saudis get a 50% interest in downstream operations in 23 U.S. eastern and gulf states and D.C. in a deal valued at about $2 billion.
Involved are Port Arthur, Tex., Convent, La., and Delaware City refineries, with combined capacity of 615,000 b/d.
Includes 50 product distribution terminals with combined 300,000 bd storage and 11,400 Texaco branded stations.

region. Of the nine states to issue proposed rules, New Jersey's rules were contested by Texaco Inc. as being too costly to consumers.

Texaco estimated that consumers would pay an additional $55 million/year without measurable benefits. Texaco made similar claims about a proposed rule in the state of New York.

New Jersey's rule would cut the Rvp of gasoline sold in the state to 9 psi from 11.5 psi during May 1-Sept. 15 each year, beginning in 1989. The proposal would reduce gasoline volume by about 5%, according to Texaco, resulting in the need to replace about 90 million gal/year.

That would increase the cost by as much as $0.03/gal because of lower gasoline yields and higher refinery costs.

Proposed rules in Pennsylvania were contested by Sun Refining & Marketing Co.

Pennsylvania's rules would limit Rvp to 9 psi for summer gasoline.

Sun contends that the rule would cut regional gasoline supply by about 5% and hike prices by $0.06-$0.09/gal.

Environmental changes in Europe are being made over a wide front. After Oct. 1, 1989, all European Community states must have unleaded gasoline available

Unleaded has made a major penetration in many Northwest European markets, but still has not taken off in Britain, France, or Italy (see Fig. 5). In addition, France and Italy have not yet reduced lead content of leaded gasoline from 0.4 g/l to the 0.15g/l required level.

Unleaded gasoline sold at the end of 1987 amounted to about 35% of all sold in West Germany, the leader in cleaning up air pollution in Europe. Most service stations in West Germany sell two grades of unleaded gasoline.

Denmark's volume of unleaded gasoline has jumped to 33% of sales in 1987, compared to 10% the preceding year.

In contrast, sales in Britain, France, and Italy were less than 0.1% of gasoline deliveries. Stations are sparse in these countries, and usually only on the most heavily traveled tourist routes.

Sulfur content limits of automotive and heating gas oil will be limited to 0.3 wt% after Jan.1, 1989, and individual EC members are empowered to impose a lower level of 0.2 wt%.

The heavy fuel oil market is divided into high sulfur product (3.5-4 wt% sulfur) and low sulfur (1 wt% sulfur). Individual countries have the right to impose a requirement for low sulfur fuel oil.

Companies have complained that meeting the low sulfur requirements of parts of West Germany, Switzerland, and Sweden places considerable strain on refiners. For instance, Rafinerie de Cressier SA in Switzerland has to run its 60,000 b/d crude unit on a single grade of low sulfur crude to meet local regulations, removing its ability to seek more competitively priced crudes.

Another octane race is possible. Process installations to meet the octane requirements of U.S. gasoline in

Outlook for U.S. winter fuels* — Table 3

	1985–86	1986–87	1987–88	Percent change 1988–87	Forecast 1988–89	Percent change 1989–99
		1,000 b/d			1,000 b/d	
MIDDLE DISTILLATE:						
Demand						
Domestic	3,136	3,148	3,329	+5.7	3,440	+3.3
Exports	112	79	78	−1.3	75	−3.8
Total	**3,248**	**3,227**	**3,407**	**+5.6**	**3,515**	**+3.2**
Supply						
Refined	2,879	2,718	2,910	+7.1	3,010	+3.4
Imported	257	268	288	+7.5	305	+5.9
From stocks	112	241	209	−13.3	200	−4.3
Total	**3,248**	**3,227**	**3,407**	**+5.6**	**3,515**	**+3.2**
Stocks (million bbl)	99	109	89	−18.3	98	+10.1
RESIDUAL FUEL OIL						
Demand						
Domestic	1,356	1,424	1,387	−2.6	1,415	+2.0
Exports	203	180	204	+13.3	190	−6.9
Total	**1,559**	**1,604**	**1,591**	**−0.8**	**1,605**	**+0.9**
Supply						
Refined	918	900	962	+6.9	985	+2.4
Imported	618	675	629	−6.8	600	−4.6
From stocks	23	29	0	—	20	—
Total	**1,559**	**1,604**	**1,591**	**−0.8**	**1,605**	**+0.9**
Stocks (million bbl)†	40	39	44	+12.8	40	−9.1
		Bcf		% change	Bcf	% change
Residential. 3,199	3,158	3,393	+7.4	3,450	+1.7	
Commercial	1,666	1,595	1,749	+9.7	1,800	+2.9
Industrial	3,262	2,907	3,488	+20.0	3,625	+3.9
Electric utilities	1,201	1,112	1,192	+7.2	1,195	+0.3
Pipeline and plant fuel	760	745	774	+3.9	780	+0.8
Total	**10,088**	**9,517**	**10,596**	**+11.3**	**10,850**	**+2.4**

* October-March heating season. †At end of March.

an unleaded gasoline environment provided U.S. refiners with an extra measure of octane producing capability. That capability, coupled with low product prices, has U.S. refiners looking at the possibility of another octane race.

Consumer demand for high octane, premium grade gasoline is growing at a greater rate overall gasoline demand. Estimated total demand in 1988 was about 3% higher than at the same time in 1987, while premium demand ran about 12% higher than a year earlier.

Because profits have been higher on premium unleaded gasoline, several refiners began to market a 93 or 94 (R+M)/2 octane premium grade.

There is some question whether there is enough octane capacity to meet the increasing demand.

Some industry officials contend the inherent constraints of the industry's octane capability eventually will drive the cost of high octane premium to a retail level than will crimp consumer demand. And higher octane will reduce overall liquid yields, causing an increase in gasoline imports.

EPA's rules on volatility could also restrict the ability of refiners to meet octane demand.

Auto makers consider redesign

The apparent availability of higher octane gasoline has caused the auto industry in the U.S. to eye additional octane as one answer to increased engine output while meeting present fuel economy standards.

The supply of higher octane grades has caused U.S. auto makers to consider redesigning engines to obtain higher compression ratios. That would allow the autos equipped with the new engines to more easily meet the corporate average fuel economy (CAFE) standards.

General Motors Corp. says that higher compression ratio engines would also allow larger cars that consumers seem to demand at present. But before an auto company can implement an engine design program, it would have to be assured that an adequate supply of high-octane gasoline would be available for an adequate period into the future.

Refiners can provide the higher octane by utilizing new octane catalysts in fluid catalytic crackers, running reforming units at higher severity, increasing throughput through alkylation units, and by blending ethers such as MTBE and ETBE as octane enhancers.

Although there is an appearance of unlimited octane for premium grades, it is estimated by some industry experts that the limit will be about two octane numbers above the present 92 (R+M)/2 premium level.

The heavy push to improve air quality in the U.S. continues to spur efforts, both technically and politically, to design vehicles that can use alternate fuels.

During 1988, the U.S. government and state governments joined automakers and the American Gas Association in promoting alternate fuels vehicles as solutions to energy and pollution problems. Bills have been approved in the U.S. congress to promote methanol, ethanol, and compressed natural gas as alternatives to gasoline.

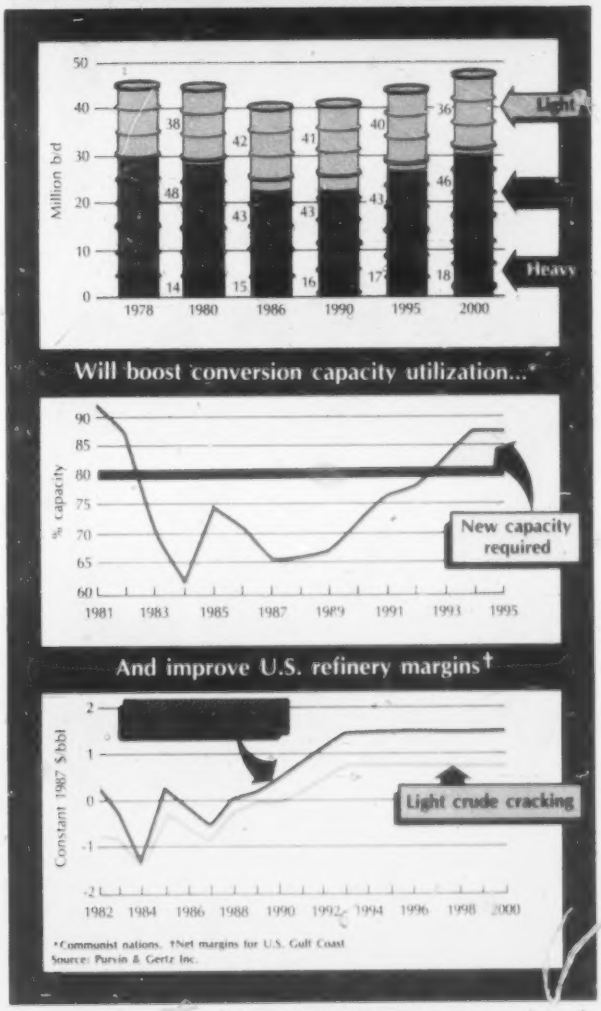
The legislation will give an automaker credits against its average fleet fuel economy for producing alternate fuel vehicles designed to run on alternative fuels.

As a result, General Motors Corp. introduced its variable fuel vehicle (VFV) that has modified engine parts and fuel storage and pumping components (see diagram 6). Ford Motor Co. offers a 1987 Crow Victoria model than runs on methanol. The American Gas Association has a Ford Ranger modified to run on compressed natural gas.

GM's VFV is designed to run on any combination of alcohol fuel and gasoline. Gm also has other development programs underway, such as a bus operated by the Golden Gate Bridge and Transit Authority in San Francisco.

Efforts by OPEC nations to guarantee placement of their crude oil in equity or other ventures with foreign refiners continued to expand during 1988. These moves are intended primarily to assure steady revenues in a volatile market.

How light-crude-supplies shortfall...* 8



Venezuela and Kuwait have led OPEC in the push downstream into foreign refineries (see table 4). Venezuela owns substantial interests in Citgo Petroleum Co. and Champlin Petroleum Co. in the U.S. Kuwait has made large investments into operations in Europe.

Other OPEC countries have also begun to increase their efforts downstream. Nigeria, for instance, is pursuing an interest in Sun Co.'s U.S. refining and marketing operations as well as a refinery in Ireland.

Saudi Arabia formalized a downstream venture with Texaco Inc. in November 1988. In the agreement, Saudi Arabian Oil Co. acquired a 50% interest in Texaco's refining and marketing business in 23 U.S. East and Gulf coast states and the District of Columbia.

The nearly $2 billion joint venture agreement includes shared inventory, crude oil purchase rights, product distribution terminals, and wholesale and retail outlets (see Fig. 7). Purchase price of the Saudi Arabia's interest was $812 million.

A shortfall of light, sweet crude supplies could be on the horizon during the latter part of this century because of

Worldwide production statistics

NORTH AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Canada	23.5 1.2	79.6 4.0	525.6 26.2	801.4 39.9	1,263.6 62.9	1,412.0 70.3	1,287.0 64.1	1,233.0 61.4	1,396.0 69.5	1,430.0 71.2	1,453.0 72.4	1,475.3 73.5	1,508.3 75.1	1,604.6 79.9
United States	3,707.4 184.6	5,407.1 269.3	7,054.6 351.3	7,804.1 388.6	9,630.0 479.6	8,569.0 426.7	8,588.0 427.7	8,655.0 431.0	8,669.0 431.7	8,750.0 435.8	8,919.0 444.2	8,790.0 437.7	8,276.7 412.2	8,165.9 406.7
Total	3,730.9 185.8	5,486.7 273.3	7,580.2 377.5	8,605.5 428.5	10,893.6 542.5	9,981.0 497.0	9,875.0 491.8	9,888.0 492.4	10,065.0 501.2	10,180.0 507.0	10,372.0 516.6	10,265.3 511.2	9,785.0 487.3	9,770.5 486.6

MIDDLE EAST

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Abu Dhabi				281.9 14.0	693.8 34.6	1,350.0 67.2	1,145.0 57.0	883.0 44.0	757.0 37.7	750.0 37.4	705.1 35.1	949.0 47.3	969.4 48.3	1,012.6 50.4
Bahrain	19.3 1.0	30.2 1.5	45.1 2.2	57.0 2.8	76.6 3.8	48.0 2.4	44.0 2.2	45.0 2.2	41.0 2.0	41.0 2.0	41.9 2.1	44.0 2.2	43.2 2.2	42.3 2.1
Dubai						349.0 17.4	358.0 17.8	357.0 17.8	327.0 16.3	324.0 16.1	348.0 17.3	350.0 17.4	381.2 19.0	355.3 17.7
Iran	181.2 9.0	664.3 33.1	1,067.6 53.2	1,885.5 93.9	3,328.8 165.8	1,467.0 73.1	1,375.0 68.5	1,896.0 94.4	2,606.0 129.8	2,166.0 107.9	2,279.0 113.5	1,806.3 90.0	2,341.7 116.6	2,207.5 109.9
Iraq	60.7 3.0	136.2 6.8	1,004.2 50.0	1,315.2 65.5	1,548.6 77.1	2,638.0 131.4	892.0 44.4	914.0 45.5	905.0 45.1	1,218.0 60.7	1,396.8 69.6	1,787.7 89.0	2,095.8 104.4	2,679.2 133.4
Israel	... ...	... ...	2.5 0.1	4.0 0.2	70.2 3.5	1.0 ...	0.3 ...	0.3 ...	0.2 ...	0.1 ...	0.1 ...	0.1 ...	1.0 ...	0.3 ...
Jordan													4.0 0.2	0.5 ...
Kuwait	... ...	344.4 17.2	1,628.2 81.1	2,169.5 108.0	2,734.5 136.2	1,382.0 68.8	916.0 45.6	675.0 33.6	912.0 45.4	925.0 46.1	823.3 41.0	1,202.0 59.9	1,095.8 54.6	1,254.2 62.5
Neutral Zone			136.2 6.8	360.9 18.0	500.6 24.9	540.0 26.9	370.0 18.4	315.0 15.7	398.0 19.8	420.0 20.9	357.8 17.8	325.7 16.2	399.2 19.9	316.3 15.8
Oman	... ...	... ...	... ...	... ...	332.4 16.6	283.0 14.1	317.0 15.8	328.0 16.3	378.0 18.8	404.0 20.1	484.3 24.1	540.8 26.9	565.0 28.1	596.7 29.7
Qatar		33.6 1.7	175.1 8.7	231.1 11.5	362.4 18.0	472.0 23.5	414.0 20.6	340.0 16.9	270.0 13.4	395.0 19.7	297.0 14.8	332.3 16.5	284.4 14.2	349.2 17.4
Ras Al Khaimah	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	5.8 0.3	9.1 0.5	11.0 0.5	10.0 0.5	10.0 0.5
Saudi Arabia	13.9 0.7	546.7 27.2	1,247.1 62.1	2,024.9 100.8	3,548.9 176.7	9,630.0 479.6	9,642.0 480.2	6,484.0 322.9	4,872.0 242.6	4,545.0 226.3	3,295.3 164.1	4,719.7 235.0	4,054.2 201.9	4,708.3 234.5
Sharjah	... ...	... ...	... ...	... ...	... ...	10.0 0.5	9.0 0.4	7.0 0.3	35.0 1.7	62.0 3.1	66.1 3.3	65.0 3.2	66.9 3.3	65.0 3.2
Syria					83.1 4.1	165.0 8.2	166.0 8.3	175.0 8.7	165.0 8.2	161.0 8.0	161.7 8.1	185.0 9.2	231.7 11.5	273.3 13.6
Turkey	... ...	0.3 ...	7.0 0.3	29.7 1.5	67.9 3.4	44.0 2.2	46.0 2.3	45.0 2.2	45.0 2.2	41.0 2.0	41.5 2.1	46.8 2.3	52.0 2.6	50.0 2.5
Yemen, North												10.0 0.5	10.0 0.5	159.9 8.0
Yemen, South	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	12.5 0.6
Total	275.1 13.7	1,755.7 87.5	5,313.0 264.5	8,359.7 416.2	13,347.8 664.7	18,379.0 915.3	15,694.3 781.5	12,464.3 620.5	11,711.2 583.0	11,457.9 570.6	10,307.0 513.4	12,375.4 616.1	12,605.5 627.8	14,093.1 701.8

EUROPE

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Austria	7.7	27.9	45.4	53.1	53.3	29.0	25.0	25.0	24.0	23.0	21.7	22.2	21.6	23.2
	0.4	1.4	2.3	2.6	2.7	1.4	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.2
Denmark	...	...	...	...	...	6.0	16.0	38.0	46.0	45.0	58.0	74.7	94.0	95.5
	...	...	...	...	...	0.3	0.8	1.9	2.3	2.2	2.9	3.7	4.7	4.8
France	1.4	2.5	38.6	59.5	45.8	26.0	34.0	33.0	32.0	35.0	49.0	59.0	63.5	68.7
	0.1	0.1	1.9	3.0	2.3	1.3	1.7	1.6	1.6	1.7	2.4	2.9	3.2	3.4
Germany, Fed. Rep.	20.1	22.2	107.3	155.0	147.2	90.0	86.0	84.0	81.0	79.0	80.5	80.0	73.8	77.9
	1.0	1.1	5.3	7.7	7.3	4.5	4.3	4.2	4.0	3.9	4.0	4.0	3.7	3.9
Greece	...	...	...	...	...	...	8.0	21.0	25.0	27.0	26.4	26.4	24.4	21.8
	...	...	...	...	...	...	0.4	1.0	1.2	1.3	1.3	1.3	1.2	1.1
Italy	0.2	0.2	37.5	47.0	26.3	39.0	37.0	28.0	37.0	45.0	41.7	49.0	50.0	92.9
	...	...	1.9	2.3	1.3	1.9	1.8	1.4	1.8	2.2	2.1	2.4	2.5	4.6
Netherlands	...	13.4	36.0	37.0	35.8	25.0	27.0	28.0	42.0	61.0	69.0	79.0	91.3	83.7
	...	0.7	1.8	1.8	1.8	1.2	1.3	1.4	2.1	3.0	3.4	3.9	4.5	4.2
Norway	...	...	...	...	...	528.0	508.0	488.0	600.0	688.0	771.0	823.3	973.3	1,069.1
	...	...	...	...	...	26.3	25.3	24.3	29.9	34.3	38.4	41.0	48.5	53.2
Spain	...	...	...	...	3.1	32.0	24.0	30.0	59.0	45.0	45.3	37.2	32.8	30.4
	...	...	...	...	0.2	1.6	1.2	1.5	2.9	2.2	2.3	1.9	1.6	1.5
United Kingdom	0.3	0.9	1.7	1.7	1.7	1,619.0	1,790.0	2,050.0	2,260.0	2,452.0	2,519.8	2,602.0	2,445.9	2,376.3
	...	...	0.1	0.1	0.1	80.6	89.1	102.1	112.5	122.1	125.5	129.6	121.8	118.3
Total	29.7	67.1	266.5	353.3	313.2	2,394.0	2,555.0	2,825.0	3,206.0	3,500.0	3,682.4	3,852.8	3,870.6	3,939.5
	1.5	3.3	13.3	17.5	15.7	119.1	127.1	140.6	159.5	174.0	183.4	191.8	192.8	196.2

ASIA-PACIFIC

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Australia	...	...	...	7.2	175.6	379.0	382.0	353.0	405.0	481.0	556.0	472.0	566.1	552.3
	...	...	...	0.4	8.7	18.9	19.0	17.6	20.2	24.0	27.7	23.5	28.2	27.5
Bangladesh	...	...	...	...	...	...	...	...	...	...	...	...	0.5	0.9
	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Brunei	19.3	84.8	92.9	80.4	148.0	230.0	166.0	155.0	155.0	160.0	149.5	170.0	133.7	138.3
	1.0	4.2	4.6	4.0	7.4	11.5	8.3	7.7	7.7	8.0	7.4	8.5	6.7	6.9
Burma	21.1	1.5	11.1	12.1	16.4	30.0	30.0	30.0	30.0	30.0	30.0	30.0	24.0	15.0
	1.1	0.1	0.6	0.6	0.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.2	0.7
China, Taiwan	...	...	0.4	0.4	1.8	5.0	3.0	3.0	2.3	2.6	2.7	1.9	2.6	2.6
	...	...	...	...	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
India	3.9	5.1	9.0	61.8	138.6	182.0	298.0	384.0	390.0	543.0	614.0	622.7	608.7	631.8
	0.2	0.3	0.4	3.1	6.9	9.1	14.8	19.1	19.4	27.0	30.6	31.0	30.3	31.5
Indonesia	169.4	132.6	411.2	485.0	853.6	1,576.0	1,607.0	1,341.0	1,292.0	1,332.0	1,219.5	1,243.8	1,185.8	1,137.5
	8.4	6.6	2.05	24.2	42.5	78.5	80.0	66.8	64.3	66.3	60.7	61.9	59.1	56.6
Japan	7.2	5.6	10.2	11.4	16.3	10.0	7.0	6.0	6.9	6.4	10.0	12.8	12.1	12.3
	0.4	0.3	0.5	0.6	0.8	0.5	0.3	0.3	0.3	0.3	0.5	0.6	0.6	0.6
Malaysia	...	...	...	...	...	288.0	259.0	306.0	370.0	462.0	432.8	503.3	467.4	540.0
	...	...	...	...	...	14.3	12.9	15.2	18.4	23.0	21.6	25.1	23.3	26.9
New Guinea	...	4.8	4.2	...	...	...	...	...	...	...	...	...	...	...
	...	0.2	0.2	...	...	...	...	...	...	...	...	...	...	...
New Zealand	...	...	...	...	...	7.0	10.0	15.0	15.0	18.0	18.0	29.3	28.3	28.0
	...	...	...	...	...	0.3	0.5	0.7	0.7	0.9	0.9	1.5	1.4	1.4
Pakistan	2.4	3.5	7.2	11.2	9.9	10.0	10.0	12.0	13.0	18.0	34.3	41.0	41.6	47.0
	0.1	0.2	0.4	0.6	0.5	0.5	0.5	0.6	0.6	0.9	1.7	2.0	2.1	2.3
Philippines	...	...	...	...	...	15.0	2.0	7.0	15.0	12.0	9.3	6.3	5.1	9.2
	...	...	...	...	...	0.7	0.1	0.3	0.7	0.6	0.5	0.3	0.3	0.5
Thailand	...	...	...	...	0.4	...	...	6.0	11.0	19.0	34.3	35.6	31.3	38.4
	...	...	...	...	...	...	...	0.3	0.5	0.9	1.7	1.8	1.6	1.9
Total	223.3	237.9	546.2	669.5	1,360.6	2,732.0	2,774.0	2,618.0	2,705.2	3,084.0	3,110.4	3,168.7	3,107.2	3,153.3
	11.2	11.9	27.2	33.5	67.7	136.0	138.0	130.2	134.4	153.5	154.9	157.8	154.9	156.9

OFF AFRICA, 1 West Manambolo is drilled near the coast of Madagascar's Morondava basin. Photo by Petro-Canada Inter. Assistance Corp.

AFRICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Algeria	...	...	182.7	551.6	1,029.1	1,016.0	750.0	750.0	686.6	608.0	643.3	600.7	647.9	666.8
	...	...	9.1	27.5	51.2	50.6	37.4	37.4	34.2	30.3	32.0	29.9	32.3	33.2
Angola (Inc. Cabinda)	...	...	1.3	13.0	13.7	150.0	140.0	122.0	174.0	207.0	228.5	280.7	341.3	449.3
	...	...	0.1	0.6	0.7	7.5	7.0	6.1	8.7	10.3	11.4	14.0	17.0	22.4
Cameroon	...	...	...	...	...	58.0	87.0	109.0	114.0	125.0	133.5	180.0	170.0	170.0
	...	...	...	...	...	2.9	4.3	5.4	5.7	6.2	6.6	9.0	8.5	8.5
Congo	...	...	...	...	...	56.0	79.0	87.0	95.0	112.0	115.1	115.0	118.0	134.8
	...	...	...	...	...	2.8	3.9	4.3	4.7	5.9	5.7	5.7	5.9	6.7
Egypt	18.1	44.9	61.6	122.7	327.3	596.0	578.0	667.0	690.0	790.0	885.8	773.7	899.3	851.3
	0.9	2.2	3.1	6.1	16.3	29.7	28.8	33.2	34.4	39.3	44.1	38.5	44.8	42.4
Gabon	...	...	16.1	25.2	108.8	180.0	147.0	130.0	150.0	150.0	150.0	146.2	155.8	175.0
	...	...	0.8	1.3	5.4	9.0	7.3	6.5	7.5	7.5	7.5	7.3	7.8	8.7
Ivory Coast	...	...	...	...	...	...	7.0	9.0	24.0	22.0	28.0	20.0	16.0	12.9
	...	...	...	...	...	...	0.3	0.4	1.2	1.1	1.4	1.0	0.8	0.6
Libya	...	...	...	1,220.0	3,318.0	1,785.0	1,063.0	1,127.0	1,020.0	1,090.0	1,045.3	1,030.7	1,019.7	1,012.5
	...	...	...	60.8	165.2	88.9	52.9	56.1	50.8	54.3	52.1	51.3	50.8	50.4
Nigeria	...	...	17.3	272.2	1,083.3	2,057.0	1,369.0	1,324.0	1,232.0	1,414.0	1,445.5	1,464.0	1,238.6	1,358.3
	...	...	0.9	13.6	53.9	102.4	68.2	65.9	61.4	70.4	72.0	72.9	61.7	67.6
Tunisia	...	...	3.0	3.6	87.7	110.0	118.0	106.0	115.0	114.0	125.0	106.0	104.3	102.8
	...	...	0.1	0.2	4.4	5.5	5.9	5.3	5.7	5.7	6.2	5.3	5.2	5.1
Zaire	...	...	...	...	...	20.0	20.0	22.0	26.0	27.0	30.5	32.1	31.8	29.5
	...	...	...	...	...	1.0	1.0	1.1	1.3	1.3	1.5	1.6	1.6	1.5
Others	...	0.8	3.0	3.6	1.5	4.0	2.2	1.7	6.6	7.7	8.9	7.6	12.3	8.0
	...	...	0.1	0.2	0.1	0.2	0.1	0.1	0.3	0.4	0.4	0.4	0.6	0.2
Total	18.1	45.7	295.0	2,211.9	5,969.4	6,032.0	4,360.2	4,454.7	4,333.2	4,672.7	4,839.4	4,756.7	4,755.0	4,968.2
	0.9	2.2	14.2	110.3	297.2	300.5	217.1	221.8	215.9	232.7	240.9	236.9	237.0	247.3

LATIN AMERICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Argentina	56.3	64.0	171.9	269.3	382.9	487.0	497.0	483.0	481.0	467.0	447.5	430.2	419.1	449.6
	2.8	3.2	8.6	13.4	19.1	24.3	24.8	24.1	24.0	23.3	22.3	21.4	20.9	22.4
Bolivia	0.8	1.7	9.8	9.2	16.3	30.0	24.0	24.0	22.0	20.0	20.0	18.7	18.5	18.8
	...	0.1	0.5	0.5	0.8	1.5	1.2	1.2	1.1	1.0	1.0	0.9	0.9	0.9
Brazil	...	0.9	80.9	94.0	160.5	182.0	215.0	252.0	315.0	437.0	540.5	578.0	562.8	555.6
	...	...	4.0	4.7	8.0	9.1	10.7	12.5	15.7	21.8	26.9	28.8	28.0	27.7
Chile	...	1.7	19.8	34.9	34.6	29.0	40.0	41.0	39.0	38.0	32.5	34.4	28.3	24.8
	...	0.1	1.0	1.7	1.7	1.4	2.0	2.0	1.9	1.9	1.6	1.7	1.4	1.2
Colombia	69.9	93.3	152.7	210.0	214.0	125.0	125.0	140.0	155.0	165.0	178.8	324.2	387.8	346.7
	3.5	4.6	7.6	10.5	10.7	6.2	6.2	7.0	7.7	8.2	8.9	16.1	19.3	17.3
Ecuador	6.4	7.2	7.7	8.0	4.1	222.0	204.0	215.0	236.0	254.0	273.3	270.1	157.2	310.1
	0.3	0.4	0.4	0.4	0.2	11.1	10.2	10.7	11.8	12.6	13.6	13.5	7.8	15.4
Guatemala	...	...	...	...	...	5.0	5.0	6.4	7.5	5.2	3.1	4.9	3.9	3.7
	...	...	...	...	...	0.2	0.2	0.3	0.4	0.3	0.2	0.2	0.2	0.2
Mexico	120.3	198.5	270.6	323.1	430.2	1,936.0	2,390.0	2,734.0	2,702.0	2,743.0	2,797.0	2,468.0	2,537.8	2,527.3
	6.0	9.9	13.5	16.1	21.4	96.4	119.0	136.2	134.6	136.6	139.3	122.9	126.4	125.9
Peru	33.2	41.1	52.6	63.2	72.2	191.0	184.0	198.0	171.0	201.0	189.0	179.0	166.7	141.7
	1.7	2.0	2.6	3.1	3.6	9.5	9.2	9.9	8.5	10.0	9.4	8.9	8.3	7.1
Trinidad & Tobago	60.9	56.5	115.7	133.9	139.8	211.0	240.0	182.0	158.0	169.0	179.0	167.9	163.1	149.3
	3.0	2.8	5.8	6.7	7.0	10.5	12.0	9.1	7.9	8.4	8.9	8.4	8.1	7.4
Venezuela	507.0	1,498.0	2,846.1	3,472.9	3,708.0	2,167.0	2,093.0	1,826.0	1,791.0	1,724.0	1,669.0	1,664.9	1,591.9	1,658.0
	25.2	74.6	141.7	173.0	184.7	107.9	104.2	90.9	89.2	85.9	83.1	82.9	79.3	82.6
Others	...	...	...	...	...	...	0.7	0.6	0.5	2.2	2.9	3.6	3.6	3.7
	...	...	...	...	...	...	...	...	...	0.1	0.1	0.2	0.2	0.2
Total	854.8	1,962.9	3,727.8	4,618.5	5,162.6	5,585.0	6,017.7	6,102.0	6,078.0	6,225.4	6,332.6	6,143.9	6,040.7	6,189.3
	42.5	97.7	185.7	230.1	257.2	278.1	299.7	303.9	302.8	310.1	315.3	305.9	300.8	308.3
Total non-Communist	5,131.9	9,556.0	17,718.7	24,818.4	37,047.7	45,103.0	41,276.2	38,352.0	38,098.6	38,120.0	38,643.8	40,562.5	40,164.0	42,113.9
	255.6	475.9	882.4	1,236.1	1,845.0	2,246.0	2,055.2	1,909.4	1,896.8	1,947.9	1,924.5	2,019.7	2,000.6	2,097.1

COMMUNIST AREAS

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1965	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988
Bulgaria	...	...	4.0	4.6	6.7	6.0	6.0	3.0	3.0	3.0	3.0	3.0	6.0	6.0
	...	...	0.2	0.2	0.3	0.3	0.3	0.1	0.1	0.1	0.1	0.1	0.3	0.3
China	...	4.0	100.0	220.0	500.0	2,119.0	2,024.4	2,042.0	2,120.0	2,250.0	2,496.0	2,620.0	2,700.0	2,733.0
	...	0.2	5.0	11.0	24.9	105.5	100.8	101.7	105.6	112.1	124.3	130.5	134.5	136.1
Czechoslovakia	...	0.8	2.7	3.9	4.1	1.9	1.7	2.0	2.0	2.0	2.0	2.0	2.0	3.0
	...	...	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
German Dem. Rep.*	...	1.0	1.0	1.0	1.2	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	8.0
	...	...	...	...	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
Hungary	...	10.1	24.3	36.1	38.7	40.6	40.5	41.0	40.0	40.0	40.0	40.0	40.0	40.0
	...	0.5	1.2	1.8	1.9	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Poland	...	3.3	3.9	6.8	8.5	6.6	6.0	4.0	5.0	5.0	5.0	4.0	4.0	4.0
	...	0.2	0.2	0.3	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Romania	...	87.7	231.0	252.4	268.6	230.9	232.0	234.0	240.0	229.0	226.0	220.0	215.0	188.0
	...	4.4	11.5	12.6	13.4	11.5	11.6	11.7	12.0	11.4	11.3	11.0	10.7	9.4
U.S.S.R.*	624.9	760.6	2,969.1	4,877.3	7,089.2	12,031.0	12,180.0	12,260.0	12,320.0	12,260.0	11,900.0	12,300.0	12,480.0	12,446.0
	31.1	37.9	147.9	242.9	353.0	599.1	606.6	610.5	613.5	610.5	592.6	612.5	621.5	619.8
Yugoslavia	0.3	2.1	18.8	40.7	57.8	84.5	87.6	87.0	82.0	80.0	81.0	83.0	84.0	76.0
	...	0.1	0.9	2.0	2.9	4.2	4.4	4.3	4.1	4.0	4.0	4.1	4.2	3.8
Others	...	2.7	14.9	19.0	37.1	50.0	57.2	81.0	86.0	96.0	86.0	77.0	80.0	85.0
	...	0.1	0.7	0.9	1.8	2.5	2.8	4.0	4.3	4.8	4.3	3.8	4.0	4.2
Total	625.2	872.3	3,369.7	5,461.8	8,011.9	14,580.5	14,645.4	14,764.0	14,908.0	14,975.0	14,849.0	15,359.0	15,621.0	15,589.0
	31.1	43.4	167.7	271.9	398.9	726.0	729.4	735.1	742.4	745.7	739.4	764.8	778.0	776.3
*Includes gas liquids														
World Total	5,757.1	10,428.3	21,088.4	30,280.2	45,059.1	59,683.5	55,921.6	53,116.0	53,006.6	54,095.0	53,492.8	55,921.8	55,785.0	57,702.9
	286.7	519.3	1,050.1	1,508.0	2,243.9	2,972.0	2,784.6	2,644.5	2,873.4	2,693.6	2,663.9	2,784.5	2,778.6	2,873.4

World oil consumption

Upper figures = 1,000 b/d
Lower figures = million t/y

	1985	1986	1987
U.S.A.	15,170 721.7	15,670 751.3	15,955 763.4
Canada	**1,490 68.5**	**1,475 68.1**	**1,500 69.4**
Total North America	16,660 790.2	17,145 819.4	17,455 832.8
Latin America	**4,425 209.7**	**4,530 215.3**	**4,645 220.6**
Total Western Hemisphere	**21,085 999.9**	**21,675 1,034.7**	**22,100 1,053.4**
Austria	**200 9.8**	**215 10.4**	**220 10.7**
Belgium & Luxembourg	430 20.8	485 23.5	485 23.5
Denmark	**220 10.7**	**215 10.5**	**205 10.0**
Finland	220 10.8	230 11.3	230 11.2
France	**1,790 84.3**	**1,830 86.0**	**1,835 86.1**
Germany, Fed. Rep.	2,390 112.9	2,530 119.9	2,430 114.6
Greece	**245 12.0**	**250 12.2**	**260 12.6**
Ireland	85 4.0	100 4.8	85 4.2
Italy	**1,730 84.4**	**1,770 86.5**	**1,845 89.8**
Netherlands	635 29.2	700 32.4	695 32.0
Norway	**200 9.0**	**200 9.3**	**205 9.5**
Portugal	180 8.8	195 9.5	195 9.4
Spain	**925 42.9**	**925 42.7**	**935 43.2**
Sweden	375 18.3	385 18.7	390 18.8

	1985	1986	1987
Switzerland	255 12.0	280 13.2	265 12.4
Turkey	**345 16.8**	**375 18.3**	**445 21.4**
United Kingdom	1,630 77.4	1,645 77.4	1,610 75.2
Other	**45 2.3**	**50 2.5**	**55 2.8**
Total Western Europe	11,900 566.4	12,380 589.1	12,390 587.4
Middle East	**2,150 108.3**	**2,150 108.3**	**2,175 109.6**
Africa	1,700 82.1	1,695 81.8	1,750 84.4
South Asia	**1,160 56.4**	**1,210 58.5**	**1,260 61.0**
Southeast Asia	2,275 110.7	2,450 119.1	2,585 125.0
Japan	**4,380 203.4**	**4,435 205.3**	**4,510 208.1**
Australasia	670 30.8	695 32.2	720 32.8
U.S.S.R.	**9,020 445.8**	**9,045 447.2**	**9,090 449.2**
Eastern Europe	2,525 123.4	2,535 123.9	2,575 125.9
China	**1,785 88.9**	**1,990 99.2**	**2,085 103.9**
Total Eastern Hemisphere	**37,565 1,816.2**	**38,585 1,864.6**	**39,140 1,887.3**
World excl. U.S.S.R. China & E. Europe	**45,320 2,158.0**	**46,690 2,229.0**	**47,490 2,261.7**
World Total	**58,650 2,816.1**	**60,260 2,899.3**	**61,240 2,940.7**

Source: British Petroleum
South Asia—Afghanistan, Bangladesh, Burma, India, Nepal, Pakistan, Sri Lanka Southeast Asia—Brunei, Malaysia, Indonesia, Hong Kong, South Korea, Philippines, Singapore, Thailand, Taiwan, Papua New Guinea, SW Pacific Islands, Australasia—Australia, New Zealand

Worldwide refining capacity

EUROPE

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Austria	...	26	47	98	280	280	244	269	268	273	204	204	204	204
	...	1.3	2.3	4.9	13.9	13.9	12.2	13.4	13.3	13.6	10.2	10.2	10.2	10.2
Belgium	12	16	171	699	1,064	1,056	1,035	693	694	693	652	648	631	631
	0.6	0.8	8.5	34.8	53.0	52.6	51.5	34.5	34.6	34.5	32.5	32.3	31.4	31.4
Cyprus	...	...	...	...	16	16	16	16	15	16	16	16	16	17
	...	...	...	...	0.8	0.8	0.8	0.8	0.7	0.8	0.8	0.8	0.8	0.8
Denmark	1	1	...	173	214	215	215	215	174	176	166	166	177	177
	...	...	...	8.6	10.7	10.7	10.7	10.7	8.7	8.8	8.3	8.3	8.8	8.8
Finland	...	...	25	176	336	336	299	299	299	299	241	241	241	241
	...	...	1.2	8.8	16.7	16.7	14.9	14.9	14.9	14.9	12.0	12.0	12.0	12.0
France	152	306	769	2,405	3,385	3,342	3,291	2,871	2,670	2,386	1,947	1,834	1,941	1,876
	7.6	15.2	38.3	119.8	168.6	166.4	163.9	143.0	133.0	118.8	97.0	91.3	96.7	93.4
Germany Fed. Rep.	48	81	573	2,351	2,986	3,021	2,937	2,471	2,386	2,172	1,933	1,720	1,648	1,518
	2.4	4.0	28.5	117.1	148.7	150.4	146.3	123.1	118.8	108.2	96.3	85.7	82.1	75.6
Greece	...	...	30	95	431	428	427	422	369	390	390	385	385	385
	...	...	1.5	4.7	21.5	21.3	21.3	21.0	18.4	19.4	19.4	19.2	19.2	19.2
Ireland	11	...	40	54	56	56	56	56	56	56	56	56	56	56
	0.5	...	2.0	2.7	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Italy	41	107	773	3,214	4,131	4,092	4,003	3,283	3,050	3,095	2,738	2,679	2,563	2,450
	2.0	5.3	38.5	160.1	205.7	203.8	199.3	163.5	151.9	154.1	136.4	133.4	127.6	122.0
Netherlands	15	77	359	1,456	1,828	1,827	1,708	1,552	1,552	1,499	1,468	1,401	1,381	1,381
	0.7	3.8	17.9	72.5	91.0	91.0	85.1	77.3	77.3	74.7	73.1	69.8	68.8	68.8
Norway	1	1	2	113	264	253	243	243	243	244	240	240	240	239
	...	...	0.1	5.6	13.1	12.6	12.1	12.1	12.1	12.2	12.0	12.0	12.0	11.9
Portugal	4	8	23	82	378	341	365	365	282	290	296	294	294	313
	0.2	0.4	1.1	4.1	18.8	17.0	18.2	18.2	14.0	14.4	14.7	14.6	14.6	15.6
Spain	11	17	144	734	1,455	1,464	1,517	1,522	1,493	1,493	1,367	1,305	1,305	1,285
	0.5	0.8	7.2	36.6	72.5	72.9	75.5	75.8	74.4	74.4	68.1	65.0	65.0	64.0
Sweden	4	26	48	253	458	451	471	453	453	439	429	437	437	427
	0.2	1.3	2.4	12.6	22.8	22.5	23.5	22.6	22.6	21.9	21.4	21.8	21.8	21.3
Switzerland	...	...	...	106	137	102	137	137	137	127	137	65	132	132
	...	...	...	5.3	6.8	5.1	6.8	6.8	6.8	6.3	6.8	3.2	6.6	6.6
United Kingdom	133	197	962	2,420	2,527	2,629	2,482	2,260	2,092	2,007	1,792	1,780	1,803	1,803
	6.6	9.8	47.9	120.5	125.8	130.9	123.6	112.5	104.2	99.9	89.2	88.6	89.8	89.8
Yugoslavia	5	8	10	228	296	297	297	297	297	297	302	483	608	609
	0.2	0.4	0.5	11.4	14.7	14.8	14.8	14.8	14.8	14.8	15.0	24.1	30.3	30.3
Total Europe	438	871	3,976	14,657	20,242	20,206	19,743	17,424	16,530	15,952	14,374	13,954	14,062	13,744
	21.5	43.1	197.9	730.1	1,007.9	1,006.2	983.3	867.8	823.3	794.5	716.0	695.1	700.5	684.5

NORTH AMERICA

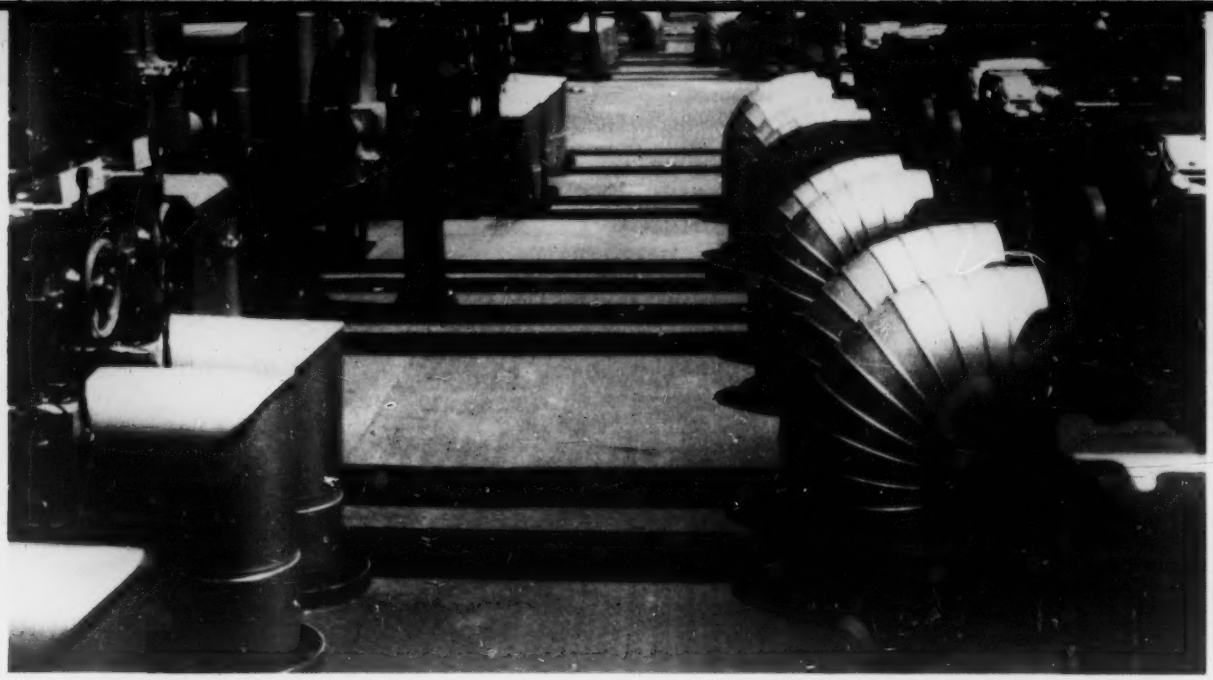
Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Canada	203	329	1,002	1,355	2,222	2,168	2,200	2,020	1,807	1,869	1,856	1,760	1,869	1,856
	10.1	16.4	49.9	67.5	110.7	107.8	109.6	100.6	90.0	93.1	92.4	87.6	93.1	92.4
United States	4,460	6,696	10,400	12,079	17,720	18,470	18,700	16,800	15,[illegible]0	15,400	15,182	15,258	15,288	15,557
	222.1	333.5	517.9	601.5	882.5	919.8	931.3	836.6	793.3	766.9	756.1	759.8	761.3	774.7
Total	4,663	7,025	11,402	13,434	19,942	20,638	20,900	18,820	17,737	17,269	17,038	17,018	17,157	17,413
	232.2	349.9	567.8	669.0	993.2	1,027.8	1,040.9	937.2	883.3	860.0	848.5	847.4	854.4	867.1

LATIN AMERICA

Upper figures = 1,000 b/d
Lower figures = million t

	1940	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Argentina	103 5.1	152 7.6	238 11.9	502 25.0	676 33.7	679 33.8	677 33.7	676 33.7	678 33.8	678 33.8	667 33.2	670 33.4	690 34.4	690 34.4
Bahamas	... ...	... ...	... ...	... ...	500 24.9	500 24.9	500 24.9	500 24.9	500 24.9	350 17.4	... ...	... ...	... ...	... ...
Barbados	... ...	... ...	... ...	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 0.1	3 ...
Bolivia	1 ...	7 0.3	12 0.6	21 1.0	74 3.7	74 3.7	61 3.0	61 3.0	47 2.3	47 2.3	47 2.3	47 2.3	47 2.3	58 2.9
Brazil	4 0.2	12 0.6	156 7.8	575 28.6	1,205 60.0	1,402 69.8	1,407 70.1	1,219 60.7	1,301 64.8	1,305 65.0	1,305 65.0	1,321 65.8	1,407 70.1	1,407 70.1
Chile	1 ...	4 0.2	24 1.2	115 5.7	139 6.9	139 6.9	141 7.0	141 7.0	141 7.0	141 7.0	141 7.0	150 7.5	141 7.0	147 7.3
Colombia	15 0.7	24 1.2	51 2.5	140 7.0	193 9.6	199 9.9	[illegible] [illegible]	214 10.7	211 10.5	211 10.5	211 10.5	226 11.3	226 11.3	227 11.3
Costa Rica	... ...	... ...	... ...	8 0.4	11 0.5	15 0.7	15 0.7	16 0.8	17 0.8	16 0.8	15 0.7	16 0.8	16 0.8	16 0.8
Cuba	4 0.2	7 0.3	87 4.3	93 4.6	160 8.0	160 8.0	160 8.0	160 8.0	160 8.0	160 8.0	160 8.0	160 8.0	160 8.0	160 8.0
Ecuador	2 0.1	5 0.2	7 0.3	37 1.8	86 4.3	87 4.3	90 4.5	79 3.9	84 4.2	82 4.1	88 4.4	88 4.4	122 6.1	123 6.1
El Salvador	... ...	... ...	... ...	14 0.7	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8	17 0.8	17 0.8	17 0.8
Guatemala	... ...	... ...	... ...	21 1.0	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8	16 0.8
Honduras	... ...	... ...	... ...	10 0.5	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7	14 0.7
Jamaica	... ...	... ...	... ...	28 1.4	34 1.7	22 1.1	22 1.1	36 1.8	36 1.8	36 1.8	36 1.8	36 1.8	36 1.8	34 1.7
Mexico	98 4.9	160 8.0	357 17.8	515 25.6	1,394 69.4	1,394 69.4	1,470 73.2	1,289 64.2	1,269 63.2	1,269 63.2	1,269 63.2	1,349 67.2	1,354 67.4	1,354 67.4
Netherlands Antilles	495 24.7	617 30.7	680 33.9	795 39.6	792 39.4	782 38.9	782 38.9	782 38.9	740 36.9	740 36.9	320 15.9	320 15.9	320 15.9	320 15.9
Nicaragua	... ...	... ...	... ...	21 1.0	14 0.7	14 0.7	14 0.7	14 0.7	15 0.7	15 0.7	15 0.7	15 0.7	15 0.7	15 0.7
Panama	... ...	... ...	... ...	140 7.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0	100 5.0
Paraguay	... ...	... ...	... ...	5 0.2	7 0.3	8 0.4	8 0.4	8 0.4	8 0.4	8 0.4	8 0.4	8 0.4	8 0.4	8 0.4
Peru	22 1.1	35 1.7	49 2.4	104 5.2	170 8.5	169 8.4	162 8.1	168 8.4	169 8.4	176 8.8	176 8.8	176 8.8	182 9.1	172 8.6
Puerto Rico	... ...	... ...	84 4.2	155 7.7	284 14.1	284 14.1	284 14.1	123 6.1	121 6.0	121 6.0	121 6.0	121 6.0	123 6.1	123 6.1
Trinidad & Tobago	49 2.4	104 5.2	182 9.1	417 20.8	456 22.7	456 22.7	456 22.7	375 18.7	375 18.7	320 15.9	260 12.9	300 14.9	300 14.9	300 14.9
Uruguay	5 0.2	16 0.8	28 1.4	40 2.0	40 2.0	40 2.0	45 2.2	45 2.2	45 2.2	45 2.2	45 2.2	45 2.2	45 2.2	33 1.6
Venezuela	55 2.7	254 12.6	886 44.1	1,324 65.9	1,446 72.0	1,349 67.2	1,323 65.9	1,284 63.9	1,224 61.0	1,224 61.0	1,230 61.3	1,225 61.0	1,201 59.8	1,201 59.8
Virgin Islands	... ...	... ...	... ...	220 11.0	728 36.3	728 36.3	640 31.9	600 29.9	600 29.9	545 27.1	600 29.9	600 29.9	545 27.1	545 27.1
Others	... ...	... ...	... ...	31 1.5	62 3.1	62 3.1	59 2.9	77 3.8	55 2.7	57 2.8	57 2.8	57 2.8	61 3.0	60 3.0
Total	854 42.3	1,397 69.4	2,841 141.5	5,334 265.3	8,620 429.2	8,712 433.7	8,664 431.3	8,016 399.1	7,945 395.6	7,695 383	6,920 344.4	7,080 352.5	7,149 355.8	7,143 355.5



FEED CONTROL VALVES on ethylene furnaces in Japanese facility (photo by Larry Hackemesser, courtesy of M.S. Kellogg Co.).

ASIA-PACIFIC

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Australia	4 0.2	14 0.7	237 11.8	581 28.9	725 36.1	743 37.0	742 37.0	716 35.7	722 36.0	697 34.7	623 31.0	626 31.2	637 31.7	644 32.1
Bangladesh	... ...	... ...	... ...	... ...	31 1.5	31 1.5	31 1.5	31 1.5	22 1.1	31 1.5	31 1.5	31 1.5	31 1.5	31 1.5
Brunei-Malaysia-Singapore	10 0.5	10 0.5	46 2.3	302 15.0	1,093 54.4	1,246 62.1	1,271 63.3	1,271 63.3	1,313 65.4	1,286 64.0	1,240 51.8	1,183 58.9	1,080 53.8	1,071 53.3
Burma*	... ...	... ...	... ...	... ...	26 1.3	26 1.3	26 1.3	26 1.3	26 1.3	26 1.3	26 1.3	26 1.3	26 1.3	26 1.3
China, Taiwan	... ...	... ...	28 1.4	129 6.4	425 21.2	515 25.6	515 25.6	515 25.6	515 25.6	543 27.0	543 27.0	543 27.0	600 29.9	570 28.4
Guam*	... ...	... ...	... ...	... ...	44 2.2	44 2.2	44 2.2	44 2.2	44 2.2	44 2.2	... ...	... ...	... ...	... ...
India	10 0.5	6 0.3	112 5.6	436 21.7	557 27.7	557 27.7	557 27.7	753 37.5	779 38.8	705 35.1	867 43.2	991 49.4	1,059 52.7	1,051 52.3
Indonesia	170 8.5	203 10.1	274 13.6	268 13.3	528 26.3	445 22.2	498 24.8	341 17.0	387 19.3	631 31.4	636 31.7	636 31.7	714 35.6	714 35.6
Japan	53 2.6	34 1.7	640 31.9	2,796 139	5,509 274.3	5,454 271.6	5,601 278.9	5,548 276.3	5,020 250.0	4,813 239.7	4,613 229.7	4,790 238.5	4,567 227.4	4,363 217.3
Korea, South	... ...	... ...	... ...	175 8.7	601 29.9	607 30.2	755 37.6	755 37.6	776 38.6	776 38.6	782 38.9	862 42.9	820 40.8	880 43.8
New Zealand*	... ...	... ...	... ...	... ...	74 3.7	74 3.7	74 3.7	74 3.7	74 3.7	53 2.6	53 2.6	54 2.7	82 4.1	88 4.4
Okinawa*	... ...	... ...	... ...	... ...	198 9.9	208 10.4	208 10.4	183 9.1	153 7.6	153 7.6	110 5.5	... ...	... ...	... ...
Pakistan	... ...	5 0.2	6 0.3	115 5.7	98 4.9	122 6.1	133 6.6	133 6.6	126 6.3	129 6.4	130 6.5	130 6.5	130 6.5	130 6.5
Philippines	... ...	... ...	22 1.1	180 9.0	253 12.6	246 12.3	286 14.2	286 14.2	286 14.2	286 14.2	216 10.8	286 14.2	286 14.2	254 12.6
Sri Lanka*	... ...	... ...	... ...	... ...	38 1.9	50 2.5	50 2.5	50 2.5	50 2.5	50 2.5	50 2.5	50 2.5	50 2.5	50 2.5
Thailand	... ...	... ...	1 ...	62 3.1	186 9.3	186 9.3	176 8.8	176 8.8	176 8.8	172 8.6	192 9.6	192 9.6	192 9.6	191 9.5
Others	27 1.3	4 0.2	9 0.4	137 6.8	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...	... ...
Total	274 13.6	276 13.7	1,375 68.4	5,181 257.8	10,386 517.2	10,594 525.7	10,987 548.1	10,902 542.9	10,469 521.4	10,385 517.4	10,112 503.8	10,400 517.9	10,274 511.6	10,083 501.1

*Prior to 1980, included in others

AFRICA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Algeria	...	...	...	47	122	122	122	137	137	464	465	465	465	465
	...	...	...	2.3	6.1	6.1	6.1	6.8	6.8*	23.1	23.2	23.2	23.2	23.2
Angola-Cabinda	...	...	2	20	36	31	32	32	32	32	32	32	32	32
	...	...	0.1	1.0	1.8	1.5	1.6	1.6	1.6	1.6	1.5	1.6	1.6	1.6
Cameroon*	...	...	...	...	...	...	43	43	41	43	43	43	43	42
	...	...	...	...	...	...	2.1	2.1	2.0	2.1	2.1	2.1	2.1	2.1
Congo*	...	...	...	...	...	...	...	...	21	21	21	21	21	21
	...	...	...	...	...	...	...	...	1.0	1.0	1.0	1.0	1.0	1.0
Egypt	17	39	87	193	234	292	292	341	369	369	434	452	452	489
	0.8	1.9	4.3	9.6	11.7	14.5	14.5	17.0	18.4	18.4	21.6	22.5	22.5	24.4
Ethiopia*	...	...	...	...	14	14	14	14	15	14	18	18	18	18
	...	...	...	...	0.7	0.7	0.7	0.7	0.7	0.7	0.9	0.9	0.9	0.9
Gabon*	...	...	...	...	20	20	20	20	20	20	23	16	23	24
	...	...	...	...	1.0	1.0	1.0	1.0	1.0	1.0	1.1	0.8	1.1	1.2
Ghana	...	...	...	29	26	26	27	27	28	28	28	28	28	27
	...	...	...	1.4	1.3	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.3
Ivory Coast	...	...	...	19	50	50	50	90	90	90	90	73	60	60
	...	...	...	0.9	2.5	2.5	2.5	4.5	4.5	4.5	4.5	3.6	3.0	3.0
Kenya	...	...	...	44	95	95	79	79	79	95	95	95	90	90
	...	...	...	2.2	4.7	4.7	3.9	3.9	3.9	4.7	4.7	4.7	4.5	4.5
Liberia*	...	...	...	...	15	15	15	15	15	15	15	15	15	15
	...	...	...	...	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Libya	...	...	...	10	138	142	130	130	125	330	330	329	329	329
	...	...	...	0.5	6.9	7.1	6.5	6.5	6.2	16.4	16.4	16.4	16.4	16.4
Madagascar*	...	...	...	...	11	11	11	16	16	16	16	16	16	16
	...	...	...	...	0.5	0.5	0.5	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Morocco	...	...	2	35	72	72	72	74	74	80	81	81	155	155
	...	...	0.1	1.7	3.6	3.6	3.6	3.7	3.7	4.0	4.0	4.0	7.7	7.7
Mozambique	...	...	...	20	16	16	16	16	17	17	17	17	...	...
	...	...	...	1.0	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	...	...
Nigeria	...	...	...	40	160	160	254	260	247	250	250	250	270	415
	...	...	...	2.0	8.0	8.0	12.6	12.9	12.3	12.5	12.5	12.5	13.4	20.7
Senegal	...	...	...	13	20	20	18	18	18	30	30	30	30	30
	...	...	...	0.6	1.0	1.0	0.9	0.9	0.9	1.5	1.5	1.5	1.5	1.5
Sierra Leone*	...	...	...	...	10	10	10	10	10	10	10	10	10	10
	...	...	...	...	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
South Africa	1	...	25	178	478	469	424	424	389	389	389	389	434	434
	...	...	1.2	8.9	23.8	23.4	21.1	21.1	19.4	19.4	19.4	19.4	21.6	21.6
Sudan	...	...	...	20	26	24	24	24	24	24	24	24	21	21
	...	...	...	1.0	1.3	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.0	1.0
Tanzania	...	...	...	14	17	12	14	17	17	14	14	14	14	14
	...	...	...	0.7	0.8	0.6	0.7	0.8	0.8	0.7	0.7	0.7	0.7	0.7
Togo*	...	...	...	...	20	20	20	20	20	20	20	20	20	...
	...	...	...	...	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	...
Tunisia	...	...	...	23	34	34	34	34	34	34	34	34	34	34
	...	...	...	1.1	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
Zaire*	...	...	...	...	16	17	17	17	17	17	17	17	17	17
	...	...	...	...	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Others	...	...	...	87	35	35	35	35	35	35	35	35	34	31
	...	...	...	4.3	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.5
Total	18	39	116	792	1,886	1,707	1,773	1,883	1,880	2,457	2,531	2,534	2,631	2,709
	0.8	1.9	5.7	39.2	92.9	84.9	88.0	94.0	93.8	122.2	125.8	125.5	130.8	130.6

*Prior to 1980, included in others

MIDDLE EAST

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Abu Dhabi*	...	...	...	...	14	14	128	135	185	185	185	185	180	180
	...	...	...	...	0.7	0.7	6.4	6.7	9.2	9.2	9.2	9.2	9.0	9.0
Bahrain	33	150	187	265	250	250	250	250	250	250	250	250	250	243
	1.6	7.5	9.3	13.2	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.1
Iran	333	502	495	702	921	1,121	530	530	530	530	530	530	530	530
	16.6	25.0	24.7	35.0	45.9	55.8	26.4	26.4	26.4	26.4	26.4	26.4	26.4	26.4
Iraq	4	9	56	83	168	169	169	169	319	319	319	319	319	319
	0.2	0.4	2.8	4.1	8.4	8.4	8.4	8.4	8.4	15.9	15.9	15.9	15.9	15.9
Israel	...	83	87	115	195	190	190	190	190	170	170	180	180	180
	...	4.1	4.3	5.7	9.7	9.5	9.5	9.5	9.5	8.5	8.5	9.0	9.0	9.0
Jordan*	...	...	...	...	21	36	91	100	100	100	100	100	100	100
	...	...	...	...	1.0	1.8	4.5	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Kuwait†	...	25	270	569	645	645	623	623	623	669	634	618	628	817
	...	1.2	13.4	28.3	32.1	32.1	31.0	31.0	31.0	33.3	31.6	30.8	31.3	40.7
Lebanon	...	6	24	37	53	52	52	52	52	17	17	37	37	37
	...	0.3	1.2	1.8	2.6	2.6	2.6	2.6	2.6	0.8	0.8	1.8	1.8	1.8
Qatar*	...	...	...	...	11	13	13	12	63	56	56	62	62	62
	...	...	...	...	0.5	0.6	0.6	0.6	3.1	2.8	2.8	3.1	3.1	3.1
Saudi Arabia†	...	140	189	465	487	487	487	705	860	840	1,115	1,125	1,375	1,375
	...	7.0	9.4	23.2	24.3	24.3	24.3	35.1	42.8	41.8	55.5	56.0	68.5	68.5
Syria	...	...	...	54	223	223	223	229	229	228	229	229	229	244
	...	...	...	2.7	11.1	11.1	11.1	11.4	11.4	11.4	11.4	11.4	11.4	12.2
Turkey	...	1	7	209	356	356	367	467	472	460	460	460	676	725
	...	...	0.3	10.4	17.7	17.7	18.3	23.3	23.5	22.9	22.9	22.9	33.7	36.1
Yemen, South	...	...	120	178	175	175	178	178	130	178	162	170	170	162
	...	...	6.0	8.9	8.7	8.7	8.9	8.9	6.5	8.9	8.1	8.5	8.5	8.1
Others	...	...	1	9	...	...	...	46	48	50	48	58	87	87
	...	...	...	0.4	...	...	...	2.3	2.4	2.5	2.4	2.9	4.3	4.3
Total	370	916	1,436	2,686	3,519	3,730	3,301	3,686	3,901	4,052	4,275	4,323	4,823	5,061
	18.4	45.5	71.4	133.7	175.2	185.8	164.5	183.7	194.3	201.9	213.0	215.4	240.4	252.2
Total, excl. U.S.S.R., China, E. Europe	8,617	10,524	21,146	42,084	64,374	63,547	65,348	60,741	58,472	57,820	56,290	55,290	56,086	56,213
	328.8	523.5	1,052.7	2,095.1	3,205.6	3,284.1	3,254.1	3,024.7	2,911.7	2,879.1	2,751.3	2,753.8	2,793.5	2,798.2

*Prior to 1980, included in others. †Includes Neutral Zone.

U.S.S.R.-EASTERN EUROPE-CHINA

Upper figures = 1,000 b/d
Lower figures = million t/y

	1940	1950	1960	1970	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
China	...	8	98	300	1,600	1,810	1,810	2,000	2,050	2,150	2,150	2,200	2,200	2,200
	...	0.4	4.9	14.9	79.7	90.1	90.1	99.6	102.1	107.1	107.1	109.6	109.6	109.6
Czechoslovakia	...	16	46	220	455	455	455	455	455	455	455	455	455	455
	...	0.8	2.3	11.0	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7	22.7
Hungary	...	20	58	130	290	312	312	311	312	242	242	242	220	220
	...	1.0	2.9	6.5	14.4	15.5	15.5	15.5	15.5	12.1	12.1	12.1	11.0	11.0
Poland	...	4	20	156	385	385	385	385	385	385	385	385	385	385
	...	0.2	1.0	7.8	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2	19.2
Romania	...	182	260	356	608	617	617	617	617	617	617	617	617	617
	...	9.1	12.9	17.7	30.3	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7	30.7
U.S.S.R.	...	900	2,800	5,640	10,950	11,400	11,600	11,750	12,000	12,200	12,260	12,260	12,260	12,300
	...	44.8	139.4	280.9	545.3	567.7	577.7	585.2	597.6	607.6	610.5	610.5	610.5	612.5
Others	...	4	40	332	852	852	852	898	894	894	894	894	852	910
	...	0.2	2.0	16.5	42.4	42.4	42.4	44.7	44.5	44.5	44.5	44.5	42.4	45.3
Total	...	1,134	3,322	7,134	15,140	15,831	16,031	16,416	16,713	16,943	17,003	17,053	16,989	17,087
	...	56.5	165.4	355.3	754.0	788.3	798.3	817.6	832.3	843.9	846.8	848.3	846.1	851.0
World Total	6,617	11,658	24,468	49,218	79,514	81,378	81,379	77,157	75,185	74,763	72,253	72,352	73,085	73,300
	328.8	580.0	1,218.1	2,450.4	3,959.6	4,052.4	4,052.4	3,842.3	3,744.0	3,723.0	3,598.1	3,603.1	3,639.6	3,650.2

LARGE DIVERTER GATE VALVE for FCC unit at Statoil's Ratinor A.S. refinery in Mongstad, Norway (Photo courtesy Tapco Inc., Houston).

Refining survey

YOUR USE OF THE INTERNATIONAL REFINing survey may be aided by the following information:

All country-by-country volumes are presented in calendar-day figures except those for the U.S. In that tabulation, only crude is reported in calendar-day figures. Cat cracking and cat reforming are given in stream-day figures.

In the U.S. tabulation, when an asterisk (*) appears beside a number in the crude column, this indicates that the figure was reported as a stream-day figure and has been converted to a calendar-day figure using the crude conversion factor of 0.95.

Calendar-day figures are the average volume a refinery unit processes each day including downtime used for turnarounds. This is actual total volume for the year divided by 365.

Steam-day figures represent the amount a unit can process when running full capacity for short periods. IPE

LEGEND

CAT CRACKING
1. Fluid
2. Other

CAT REFORMING
Semiregenerative:
1. Conventional catalyst
2. Bimetallic catalyst

Cyclic:
3. Conventional catalyst
4. Bimetallic catalyst

Other:
5. Conventional catalyst
6. Bimetallic catalyst

Cat reforming definitions are:

Semiregenerative. Characterized by shutdown to the reforming unit at specified intervals or at the operator's convenience for regeneration of catalyst in situ.

Cyclic. Characterized by continuous or continual regeneration of catalyst in situ in any one of several reactors that can be isolated from and returned to the reforming operation. This is accomplished without changing feed rate or octane.

Other includes:

Nonregenerative—catalyst replaced by fresh catalyst.

Continuous—continuous regeneration of a part of the catalyst in a special regenerator followed by continuous addition to the reactor.

Moving-bed catalyst systems.

Survey of operating refineries worldwide

(capacities of January 1, 1989)

Country	No. plants	b/cd Crude	Catalytic cracking	Catalytic reforming
Abu Dhabi	2	180,000	....	30,055
Algeria	4	464,700	....	55,600
Angola	1	32,100	....	1,900
Argentina	11	690,400	124,800	41,000
Australia	10	644,100	190,300	159,600
Austria	1	204,000	24,000	32,000
Bahrain	1	243,000	39,000	18,000
Bangladesh	1	31,200	....	1,650
Barbados	1	3,000	....	....
Belgium	4	630,500	102,000	80,300
Bolivia	3	57,500	....	14,900
Brazil	13	1,407,300	350,500	24,800
Brunei	1	10,000	....	....
Burma	2	26,300	....	....
Cameroon	1	42,000	....	7,000
Canada	27	1,855,800	387,600	369,600
Chile	3	146,800	36,670	10,000
China, Taiwan	2	570,000	22,500	56,250
Colombia	4	227,400	91,000	6,000
Congo	1	21,000	....	2,000
Costa Rica	1	16,200	....	1,200
Cote d'Ivoire	2	60,000	....	16,600
Cyprus	1	17,100	....	4,250
Denmark	3	176,500	....	31,700
Dominican Republic	2	47,000	....	7,500
Ecuador	3	123,300	16,000	2,780
Egypt	8	489,203	....	30,940
El Salvador	1	17,000	....	3,800
Ethiopia	1	18,000	....	2,270
Finland	2	241,000	41,800	42,900
France	14	1,875,970	319,200	247,000
Gabon	1	24,000	....	1,400
Germany	15	1,518,200	179,400	275,100
Ghana	1	26,600	....	5,850
Greece	4	384,500	50,500	51,300
Guatemala	1	16,000	....	3,000
Honduras	1	14,000	....	1,800
Hungary	3	220,000	20,000	23,000
India	12	1,051,441	133,953	26,030
Indonesia	6	714,200	12,600	61,500
Iran	4	530,000	....	63,845
Iraq	8	318,500	....	43,500
Ireland	1	56,000	....	11,000
Israel	2	180,000	20,000	26,000
Italy	19	2,450,200	278,300	284,300
Jamaica	1	34,200	....	3,240
Japan	41	4,362,750	596,950	551,650
Jordan	1	100,000	4,410	8,640
Kenya	1	90,000	....	9,000
Korea	6	880,000	....	62,450
Kuwait	4	817,000	42,000	33,000
Lebanon	2	37,000	7,250	7,492
Liberia	1	15,000	....	2,000
Libya	3	329,400	....	13,982
Madagascar	1	16,350	....	2,600
Malaysia	4	209,300	....	21,980
Martinique	1	12,800	....	7,410
Mexico	9	1,354,000	267,000	157,800
Morocco	2	154,600	5,600	26,800
Netherlands	7	1,380,700	125,500	166,400
Netherlands Antilles	1	320,000	42,000	15,000
New Zealand	1	88,400	....	21,900
Nicaragua	1	14,500	....	2,800
Nigeria	4	414,500	84,000	71,000
Norway	3	239,400	....	30,100
Oman	1	76,932	....	15,386
Pakistan	3	130,050	....	5,450
Panama	1	100,000	....	7,500
Paraguay	1	7,500	....	....
Peru	6	172,438	22,540	1,680
Philippines	4	254,000	23,100	39,400
Portugal	3	313,300	10,100	52,200
Puerto Rico	2	123,000	12,000	5,800
Qatar	1	62,000	....	12,030
Saudi Arabia	7	1,375,000	76,000	180,900
Senegal	1	29,800	....	2,870
Sierra Leone	1	10,000	....	....
Singapore	5	852,000	....	58,300
Somalia	1	10,000	....	....
South Africa	4	433,500	84,400	62,800
Spain	10	1,285,000	164,000	171,600
Sri Lanka	1	50,000	....	3,750
Sudan	1	21,440	....	1,700
Sweden	5	426,500	25,000	71,000
Switzerland	2	132,000	....	26,000
Syria	2	243,744	....	18,994
Tanzania	1	13,500	....	3,000
Thailand	3	191,045	8,100	26,280
Trinidad	2	300,000	28,000	31,000
Tunisia	1	34,000	....	3,300
Turkey	5	724,654	34,128	63,127
United Kingdom	15	1,803,100	442,000	307,500
Uruguay	1	33,000	4,100	2,500
Venezuela	6	1,201,100	193,100	6,000
Virgin Islands	1	545,000	....	125,000
Yemen, N.	1	10,000	....	2,500
Yemen, S.	1	161,500	....	10,800
Yugoslavia	7	609,135	52,050	74,612
Zaire	1	16,700	....	3,500
Zambia	1	20,594	....	5,070
Total	411	40,713,446	4,793,451	4,796,013

Country-by-country refining survey

WORLDWIDE REFINING	b/cd Crude capacity	Catalytic cracking	Cat reforming
ABU DHABI			
Abu Dhabi National Oil Co –Ruwais	120,000		[2]19,150
Umm Al-Nar 2	60,000		[4]10,905
Total	**180,000**	....	**30,055**
ALBANIA			
Government-owned refineries at Ballsh, Cerrik, Stalin			
Total	**40,000**		
ALGERIA			
Sonatrach: Arzew	60,000		8,600
Hassi Messaoud	23,700		2,000
Maison Carree	58,000		15,000
Skikda	323,000		30,000
Total	**464,700**	....	**55,600**
ANGOLA			
Petrangol SARL–Luanda	**32,100**	....	[1]**1,900**
ARGENTINA			
Destileria Argentina de Petroleo SA–			
Lomas de Zamora	2,000		
Esso SAPA–Campana	94,500	[1]29,700	[2]8,500
Galvan	18,600		
Isaura SA–Bahia Blanca	12,000		
Shell Cia. Argentina de P. roleo SA–			
Buenos Aires	121,700	[1]29,200	[1]12,000
Yacimientos Petroliferos Fiscales–			
Campo Duran	32,000		
Dock Sud	4,000		
La Plata	216,000	[1]45,000	[1]9,000
Lujan de Cuyo	129,000	[1]20,900	[1]9,000
Plaza Huincul	23,000		[2]2,500
San Lorenzo	37,600		
Total	**690,400**	**124,800**	**41,000**
AUSTRALIA			
Ampol Refineries Ltd –Lytton	72,000	[1]27,500	[1]13,000
Australian Lubricating Oil Refinery Ltd –Kurnell			
BP Australia–Brisbane	42,000	[1]15,800	[2]8,500
Kwinana	100,000	[1]24,000	[1]6,400
			[2]16,400
Caltex Refining CPL–Kurnell[1]	100,000	[1]39,000	[1]25,600
Mobil Oil Australia Ltd –Adelaide			
Petroleum Refineries Australia PL–			
Adelaide	46,500		[2]20,000
Altona	98,600	[2]24,000	[4]28,000
Shell Refining (Australia) PL –Clyde	75,000	[1]35,000	[2]13,700
Geelong	110,000	[1]25,000	[2]8,000
			[4]20,000
Total	**644,100**	**190,300**	**159,600**
Solvent extraction: [1]4,800 b/cd			
AUSTRIA			
OeMV–Schwechat	204,000	[1]24,000	[2]14,000
			[4]18,000
Total	**204,000**	**24,000**	**32,000**
BAHRAIN			
Bahrain Petroleum Co. BSC (Closed) –Sitra	**243,000**	[1]**39,000**	[2]**18,000**

WORLDWIDE REFINING	b/cd Crude capacity	Catalytic cracking	Cat reforming
BANGLADESH			
Eastern Refinery Ltd –Chittagong	**31,200**	....	[1]**1,650**
BARBADOS			
Mobil Oil Barbados Ltd –Bridgetown	**3,000**	....	....
BELGIUM			
Belgian Refining Corp. NV–Antwerp	91,500		[2]12,000
Esso Inc –Antwerp	218,000	[1]25,500	[4]38,100
Nynas Petroleum NV—Antwerp	15,000		
Fina Raffinadelj Antwerpen–Antwerp	306,000	[1]76,500	[2]30,200
Total	**630,500**	**102,000**	**80,300**
BOLIVIA			
Yacimientos Petroliferos			
Fiscales Bolivianos–Cochabamba[1]	39,500		[1]8,500
Santa Cruz	15,000		[2]6,400
Sucre	3,000		
Total	**57,500**	....	**14,900**
[1]Solvent extraction: 166 b/cd			
BRAZIL			
Petroleo Brasileiro SA: Araucaria,			
Parana	151,000	[1]47,200	
Betim, Minas Gerais	144,600	[1]34,100	
Canoas, Rio Grande do Sul	72,300	[1]15,100	
Cubatão, São Paulo	163,600	[1]53,400	[1]11,000
Duque de Caxias, Rio de Janeiro	226,600	[1]47,200	[1]13,800
Fortaleza, Ceara			
Manaus, Amazonas	10,000	[1]2,000	
Mataripe, Bahia	121,400	[1]27,700	
Maua, Santo Andre, São Paulo	32,500	[2]18,200	
Paulinia, São Paulo	302,000	[1]44,000	
São José dos Campos, São Paulo	164,000	[1]59,100	
Refinaria de Petroleo Ipiranga SA–Rio Grande do Sul	9,300	[1]2,500	
Refinaria de Petroleos de Manguinhos SA–Rio de Janeiro	10,000		
Total	**1,407,300**	**350,500**	**24,800**
BRUNEI			
Brunei Shell Petroleum CL–Seria	**10,000**	....	....
BULGARIA			
Government-owned refineries at Burgas, Pleven, Ruse			
Total	**300,000**		
BURMA			
Petrochemical Industries Corp –Chauk	6,300		
Syriam	20,000		
Total	**26,300**	....	....
CAMEROON			
Sonara–National Refining CL–			
Cape Limboh, Limbe	**42,000**	....	[2]**7,000**
CANADA			
Alberta			
Husky Oil Operations Ltd –Lloydminster	23,500		
Imperial Oil Ltd –Edmonton	164,900	[1]47,000	[4]20,900
Petro-Canada Products Inc –			
Edmonton	115,500	[1]36,000	[2]12,600

WORLDWIDE REFINING	Crude capacity	b/cd Catalytic cracking	Cat reforming
Shell Canada Ltd –Scotford	59,700		[5]21,500
Turbo Resources Ltd –Balzac	27,500	[1]8,800	[2]7,550
Total	**391,100**	**91,800**	**62,550**
British Columbia			
Chevron Canada Ltd –North Burnaby	36,000	[1]10,500	[1]10,000
Husky Oil Operations Ltd – Prince George	9,500	[1]3,300	[2]1,400
Imperial Oil Ltd –Ioco	42,800	[1]12,300	[2]6,700
Petro-Canada Products Inc – Fort Moody	37,200		[2]8,600
Taylor	17,400	[1]6,300	[2]3,090
Shell Canada Ltd –Shellburn, Burnaby	24,000	[1]5,400	[2]3,600
Total	**166,900**	**37,800**	**33,300**
New Brunswick			
Irving Oil Ltd –St. John	237,500	[1]17,100	[2]34,650
Total	**237,500**	**17,100**	**34,650**
Newfoundland			
Newfoundland Processing Ltd – Come By Chance	105,000	....	[2]26,000
Total	**105,000**	....	**26,000**
Northwest Territories			
Imperial Oil Ltd –Norman Wells	3,500		
Nova Scotia			
Imperial Oil Ltd –Dartmouth	82,300	[1]23,000	[4]8,600
Texaco Canada Ltd –Halifax	20,000	[1]7,200	[2]3,600
Total	**102,300**	**30,200**	**12,200**
Ontario			
Imperial Oil Ltd –Sarnia	122,600	[1]23,500	[2]13,300 [4]14,300
Petro-Canada Products Inc –Clarkson	41,500		[5]9,800
Oakville	80,500	[1]25,400	[1]5,000 [2]11,500
Shell Canada Ltd –Sarnia	71,000	[1]14,400	[2]21,000
Suncor Inc –Sarnia	70,000	[2]16,000	[2]26,000
Texaco Canada Ltd –Nanticoke	95,000	[1]40,000	[2]24,000
Total	**480,000**	**119,300**	**124,900**
Quebec			
Petro-Canada Products Inc –Montreal	87,400	[1]17,200	[2]31,300
Shell Canada Ltd –Montreal	120,000	[1]22,000	[2]20,700
Ultramar Canada Inc –St. Romuald	103,000	[1]34,600	[2]15,000
Total	**310,400**	**73,800**	**67,000**
Saskatchewan			
Consumers' Cooperative Refineries Ltd –Regina	45,200	[1]17,600	[2]9,000
Petro-Canada Products Inc – Moose Jaw	13,300		
Total	**58,500**	**17,600**	**9,000**
Total Canada	**1,855,800**	**387,600**	**369,600**

CHILE

ENAP–Gregorio-Magallanes	8,800		
Petrox SA–Talcahuano	72,000	[1]6,670	[2]4,000
Refineria de Concón–Concón	66,000	[1]20,000	[1]6,000
Total	**146,800**	**36,670**	**10,000**

CHINA

Government-owned refineries at Anshan, Beijing, Dalian, Daqing, Fushun, Hangzhou, Jinxi, Karamai-Dushanzi, Lanchow, Lenghu, Maoming, Nanchong, Nanjing, Shanghai, Shengli, Tianjin, Yumen.

Total	**2,200,000**

CHINA, TAIWAN

Chinese Petroleum Corp –Kaohsiung	446,500	[1]22,500	[2]36,000
Tao-Yuan	123,500		[2]20,250
Total	**570,000**	**22,500**	**56,250**

WORLDWIDE REFINING	Crude capacity	b/cd Catalytic cracking	Cat reforming
COLOMBIA			
Empresa Colombiana de Petróleos –Barrancabermeja-Santander[7]	150,000	[1]62,000	[2]6,000
Cartagena, Bolivar	70,000	[1]29,000	
Orito, Putumayo	2,400		
Tibu, N. de Santander	5,000		
Total	**227,400**	**91,000**	**6,000**
Solvent extraction: [1]35,000 b/cd			
CONGO			
Coraf–Pointe-Noire	21,000	....	[2]2,000
COSTA RICA			
Refinadora Costarricense de Petroleo SA–Limón	16,200		[2]1,200
COTE d'IVOIRE			
Ste. Ivoirienne de Raffinage–Abidjan	50,000		[2]16,600
Ste. Multinationale de Bitumes–Abidjan	10,000		
Total	**60,000**	....	**16,600**
CUBA			
Government-owned refineries at Cabaiguan, Havana, Santiago de Cuba			
Total	**160,000**		
CYPRUS			
Cyprus Petroleum Refinery Ltd.– Larnaca	17,100	....	[2]4,250
CZECHOSLOVAKIA			
Government owned refineries at Bratislava, Kolin, Kralupi, Pardubice, Strazke, Zaluzi, Zyolen			
Total	**455,000**		
DENMARK			
AS Dansk Shell–Fredericia	55,000		[2]12,000
Statoil AS–Kalundborg	65,000		[2]9,200
Kuwait Petroleum Refining (Danmark) A/S–Gulfhavn	56,500		[2]10,500
Total	**176,500**	....	**31,700**
DOMINICAN REPUBLIC			
Falconbridge Dominicana C por A–La Peguera	16,000		
Refineria Dominicana de Petróleo SA–Haina	31,000		[1]7,500
Total	**47,000**	....	**7,500**
ECUADOR			
CEPE–Esmeraldas	90,000	[1]16,000	[2]2,780
Anglo Ecuadorian Oilfields Ltd – Sta. Elena Peninsula	32,300		
Texaco–Lago-Agrio	1,000		
Total	**123,300**	**16,000**	**2,780**
EGYPT			
Alexandria Petroleum Co –Alexandria (El-Mex)	99,250		
Cairo Oil Refining Co –Mostorod	125,060		[2]9,000
Tanta	21,800		
El Ameria Oil Refining Co – Alexandria	60,340		[2]9,400
El-Nasr Petroleum Co –El-Suez	58,400		
Wadi-Feran	9,680		
Suez Oil Processing Co –El-Suez	52,530		[2]12,540
Assiout	52,143		
Total	**489,203**	....	**30,940**

WORLDWIDE REFINING	b/cd Crude capacity	Catalytic cracking	Cat reforming
EI SALVADOR			
Refineria Petrolera Acajutla SA–Acajutla	17,000	[1]3,200	
Total	17,000	3,200	....
ETHIOPIA			
Ethiopian Petroleum Corp.–Assab	18,000	....	[2]2,270
FINLAND			
Neste Oy–Naantali	44,000	[1]13,300	[1]6,800
Porvoo	197,000	[1]28,500	[1]36,100
Total	241,000	41,800	42,900
FRANCE			
CRD—Total France–Gonfreville L'Orcher	309,000	[1]31,500	[4]5,400
La Mede	136,000	[1]29,700	[4]23,400
Mardyck	122,000	[1]29,800	[4]20,500
Cie. Rhenane de Raffinage–Reichstett-Vendenheim	85,000	[1]14,000	[2]13,000
Elf France–Donges	200,000	[1]44,000	[2]25,400
Feyzin	175,070	[1]21,400	[3]8,400
Grandpuits	92,000	[1]28,800	[1]12,900
Esso SAF–Fos sur Mer	100,000	[1]17,000	[1]16,000
Port Jerome	136,000	[1]20,000	[1]16,000
Mobil Oil Francaise–Notre Dame de Gravenchon	57,000	....	[1]13,300
Shell Francaise–Berre l'Etang	128,000	[1]38,000	[1]19,000
Petit Couronne	154,000	[1]19,000	[2]28,000
Ste. Francaise des Petroles BP–Dunkirk	—	....	....
Lavera	181,900	[1]26,000	[1]5,700
Total	1,875,970	319,200	247,000
[1]Solvent extraction: 9,800 b/cd			
GABON			
Ste. Gabonaise de Raffinage–Port Gentil	24,000	....	[1]1,400
GERMANY, E.			
Government-owned	470,000	....	....
GERMANY, WEST			
Deutsche BP-Erdol Ingolstadt–Vohburg†	102,000	[1]17,200	[1]17,200
Deutsche Marathon Petroleum GmbH–Burghausen	70,000	....	....
Deutsche Shell AG–Gudort	170,000	....	[1]17,000
		....	[5]21,000
Harburg-Grasbrook	86,000	[1]15,000	[1]16,000
Deutsche Texaco AG–Heide	80,000	[1]9,000	[1]18,000
Erdoel Raffinerie Neustadt GmbH–Neustadt-Donau	144,000	[1]22,700	[1]17,700
Esso AG–Ingolstadt	95,000	[1]24,500	[1]12,800
Karlsruhe	150,000	....	[1]27,900
Mobil Oil AG–Worth	93,000	[1]19,000	[1]15,900
Oberrheinische Mineralolwerke GmbH–Karlsruhe	142,000	[1]66,000	[1]11,400
			[5]20,100
Ruhr Oel GmbH–Gelsenkirchen	215,400	[1]6,000	[1]11,900
			[5]27,000
Union Rheinische Braunkohlen Kraftstoff AG–Wesseling	103,000	....	[1]14,000
Wintershall AG–Lingen	65,000	....	[1]12,200
			[1]15,000
Mannheim Salzbergen	2,800	....	....
Total	1,518,200	179,400	275,100
†Operating on a semi-integrated basis			
GHANA			
Ghanaian Italian Petroleum CL–Tema	26,600	....	[1]5,850
GREECE			
Hellenic Aspropyrgos Refinery SA–Aspropyrgos	110,000	[1]23,300	[1]14,700
			[5]20,000
Motor Oil (Hellas) Corinth Refineries SA–Aghii Theodori	100,000	[1]27,200	[1]8,500
Petrola Hellas SA–Elefsis	108,000	....	....
Thessaloniki Refining Co. AE–Thessaloniki	66,500	....	[2]8,100
Total	384,500	50,500	51,300
GUATEMALA			
Texas Petroleum Co.–Escuintla	16,000	....	[2]3,000
HONDURAS			
Refineria Texas de Honduras SA–Puerto Cortes	14,000	....	[1]1,800
HUNGARY			
Dunai KV–Szazhalombatta	150,000	[1]20,000	[2]23,000
Tiszai KV–Leninvaros	60,000	....	....
Zalai KV–Zalaegerszeg	10,000	....	....
Total	220,000	20,000	23,000
INDIA			
Bharat Petroleum CL–Mahul, Bombay	140,000	[1]31,000	[1]5,200
Bongaigaon Refinery & Petrochemicals Ltd.–Bongaigaon, Assam	27,392	....	[2]1,930
Cochin Refineries Ltd.–Kerala	90,000	[1]20,000	[1]5,000
Hindustan Petroleum CL–Mahul, Bombay†	110,000	[1]12,000	....
Visakhapatnam	92,699	[1]19,583	....
Indian Oil CL–Barauni	66,000	....	....
Digboi	10,050	....	....
Gauhati	60,400	....	....
Gujarat	165,200	[1]19,800	[2]7,000
Haldia	55,000	....	[3]4,500
Mathura	120,000	[1]19,800	....
Madras Refineries Ltd.–Madras	114,700	[1]11,770	[2]2,400
Total	1,051,441	133,953	26,030
[1]Solvent extraction: 10,000 b/cd			
INDONESIA			
Pertamina–Balikpapan, Kalimantan	221,500	....	[5]18,000
Cilacap, Central Java	271,200	....	[1]12,000
		....	[5]18,000
Dumai, Central Sumatra	99,400	....	[1]5,600
		....	[2]7,900
Musi, South Sumatra	81,400	[1]12,600	....
Pangakalan Brandan, North Sumatra	4,500	....	....
Sungai Pakning, Central Sumatra	36,200	....	....
Total	714,200	12,600	61,500
IRAN			
National Iranian Oil Co.–Esfahan	200,000	....	29,600
Shiraz	40,000	....	6,245
Tabriz	80,000	....	....
Tehran	210,000	....	28,000
Total	530,000	....	63,845
Note: Present status uncertain due to Iran-Iraq war			
IRAQ			
Oil Refineries Administration–Baiji	150,000	....	22,000
		....	16,500
Basra	70,000	....	....
Daura	71,000	....	5,000
K3-Haditha	7,000	....	....
Khanaqin	12,000	....	....
Muftihia	4,500	....	....
Qaiyarah, Mosul	2,000	....	....
Iraqi Company for Oil Operations–Kirkuk	2,000	....	....
Total	318,500	....	43,500
Note: Present status uncertain due to Iran-Iraq war			

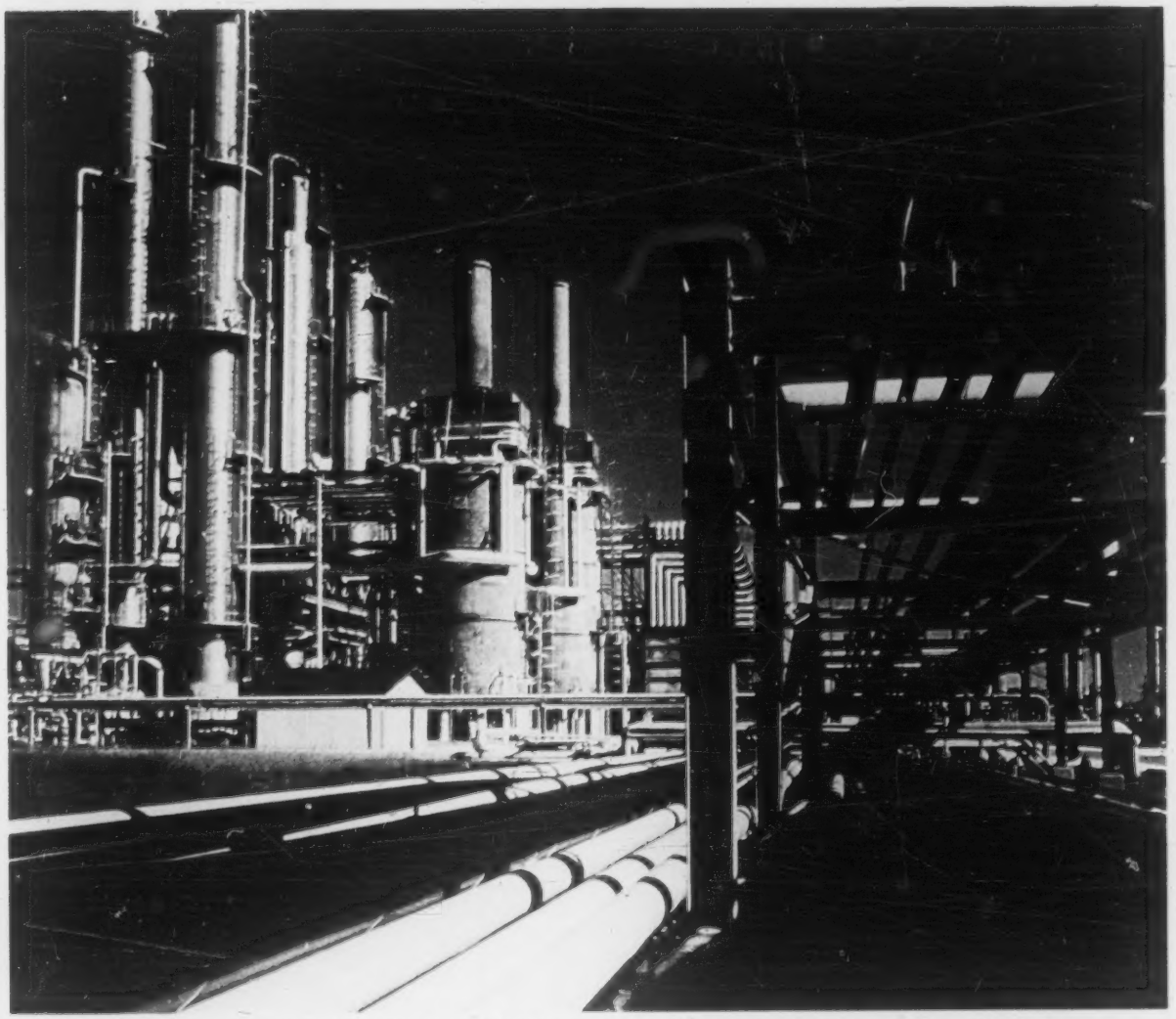
WORLDWIDE REFINING	Crude capacity	b/cd Catalytic cracking	Cat reforming
IRELAND			
Irish Refining plc–			
Whitegate	56,000		[4]11,000
ISRAEL			
Oil Refineries Ltd –Ashdod	70,000		[2]10,000
Haifa	110,000	[1]22,000	[2]16,000
Total	180,000	22,000	26,000
ITALY			
Agip Plus SpA–Livorno	100,000		[2]9,500
Agip Raffinazione–Rho, Milan	79,800	[2]14,300	[2]17,000
Sannazzaro, Pavia	210,000	[1]27,000	[2]10,000
			[2]16,700
Taranto	83,800		[2]17,000
Venezia	90,000		[2]16,000
Anonima Petroli Italiana–Falconara Marittima	78,900		[2]10,500
Arcola Petrolifera SpA–La Spezia	18,000		
Esso Italiana SpA–Augusta, Siracusa	180,000	[1]45,300	[2]9,300
			[4]7,300
Industrie Chimiche Italiane de Petrolio SpA–Frassino, Mantova	55,000		[2]7,000
Iplom SpA–Busalla	46,500		
Isab–Melilli	220,000		[3]34,500
Mobil Oil Italiana SpA–Naples	100,000	[2]18,400 –	[2]12,500
Raffineria di Roma SpA–Rome	80,500		[2]14,200
Raffineria Mediterranea SrL–Milazzo	160,000	[1]28,000	[2]11,000
Raffineria Siciliana SrL–Gela	80,000	[1]34,000	[2]10,000
Saras SpA–Sarroch	285,000	[1]63,000	[2]27,000
Sarpom–Trecate, Novara	248,200	[1]16,300	[2]18,500
			[4]8,100
Selm-Soc. Energia Montedison–Priolo	240,000	[1]32,000	[2]9,000
Tamoil Italia SpA–Cremona	95,000		[1]3,800
			[2]6,400
Total	2,450,200	278,300	284,300
JAMAICA			
Petrojam Ltd –Kingston	34,200		[1]3,240
JAPAN			
Asia Oil CL–Sakaide, Kagawa	13,500	[1]13,500	[2]9,000
Cosmo Oil CL–Chiba	209,000	[1]26,600	[2]31,800
Sakai	104,500	[1]7,550	[2]6,650
Yokkaichi City	166,300	[1]23,700	[2]5,400
			[4]9,900
Fuji Oil CL–Sodegaura	126,600	14,000	[2]13,600
General Sekiyu Seisei KK–Sakai	140,400	32,500	[2]26,100
Idemitsu Kosan CL–Chita, Aichi	123,500	[1]27,000	[4]16,200
Himeji, Hyogo	104,500		[2]12,600
Ichihara, Chiba	199,500	[1]37,800	[2]15,300
Tokuyama, Yamaguchi	95,000	[1]20,700	
Tomakomai, Hokkaido	85,500	[2]16,200	
Kainan Petroleum Refining CL–Kainan	64,000		
Kashima Oil CL–Kashima, Ibaragi	150,000	[1]17,500	[4]14,000
Koa Oil CL–Marifu	110,000	[1]20,000	[2]9,700
Osaka	80,000	[1]8,000	[2]9,000
Kyokuto Petroleum Ltd –Chiba	120,000		[2]19,000
Kyushu Oil CL–Oita	130,000	[1]16,500	[2]8,000
Mitsubishi Oil CL–Kawasaki	55,000		[2]8,500
Mizushima	220,000	[1]34,000	[2]25,000
			[4]18,500
Nansei Sekiyu KK–Nishihara, Okinawa	45,000		[2]8,600
Nichimo Sekiyu Seisei KK–Kawasaki	76,000		[1]7,600
Nihonkai Oil CL–Toyama	50,000		4,000
Nippon Mining CL–Chita	85,000	[1]13,000	[2]22,000
Funakawa	6,000		
Mizushima	190,200	[1]38,000	[2]20,000
Nippon Oil CL–Niigata	26,000	[2]4,000	
Nippon Petroleum Refining CL–			
Muroran	150,000	[1]21,000	[2]21,000
Nakagusuku, Okinawa			[2]2,500
Negishi	305,000	[1]39,000	[2]20,000
			[4]30,000
Yokohama			[2]1,300
Okinawa Sekiyu Seisei–Yonashiro, Okinawa	57,000		
Seibu Oil CL–Yamaguchi	110,100	[1]8,100	[2]17,800
Showa Shell Sekiyu KK–Kawasaki	136,800		[2]19,100
Niigata	27,500		[2]4,300
Showa Yokkaichi Sekiyu CL–Yokkaichi	215,700	[1]22,600	[2]38,100
Taiyo Oil CL–Ehime	61,750		[2]5,400
Toa Nenryo Kogyo–Kawasaki	190,000	[1]74,100	[2]15,200
Wakayama	157,700	[1]31,600	[2]34,200
Toa Oil CL–Kawasaki	65,000		[2]11,000
Tohō Oil CL–Owase	35,000		
Tohoku Oil CL–Sendai	75,700		[2]11,300
Total	4,362,750	596,950	551,650
JORDAN			
Jordan Petroleum Refinery–Zerka	100,000	[1]4,410	[2]8,640
KENYA			
Kenya Petroleum Refineries Ltd –			
Mombasa	90,000		[1]3,800
			[2]5,200
Total	90,000	....	9,000
KOREA, N.			
Government-owned, Unggi	42,000		
KOREA, S.			
Honam Oil Refinery CL–Yosu	355,000		[2]15,300
Kukdong Oil CL–Busan[1]	10,000		
–Daesan	60,000		[2]3,000
Kyung In Energy CL–Inchon	60,000		[2]3,600
Ssangyong Oil Refining CL–Onsan[2]	90,000		[1]4,000
Yukong Ltd –Ulsan	305,000		[2]17,650
			[5]18,900
Total	880,000	....	62,450
Solvent extraction: [1]2,100 b/d [2]8,000 b/d			
KUWAIT			
Getty Oil Co. (subsidiary of Texaco Inc.)–Mina Al-Zour	70,000		
Kuwait National Petroleum Co.–Mina Abdulla	190,000		
Mina Al-Ahmadi	370,000	[1]28,000	[2]33,000
Shuaiba	187,000	[2]14,000	
Total	817,000	42,000	33,000
LEBANON			
Tripoli Oil Installations–Tripoli	20,000	[1]7,250	[2]4,392
Mediterranean Refining Co.–Sidon	17,000		[1]3,100
Total	37,000	7,250	7,492
LIBERIA			
Liberia Petroleum Refining–Monrovia	15,000		[1]2,000
LIBYA			
Azzawiya Oil Refining Co.–Azzawiya	120,000		[2]12,982
Ras Lanuf Oil & Gas Processing Co.–Ras Lanuf	201,000		
Sirte Oil Co.–Brega	8,400		[1]1,000
Total	329,400	....	13,982
MADAGASCAR			
Solima–Managareza, Tamatave	16,350	....	[1]2,600
MALAYSIA			
Esso Malaysia Berhad–Port Dickson	47,300		[2]7,980
Petronas Penapisan Sdn. Berhad–Kerteh, Kemaman, Terengganu	27,000		
Sarawak Shell Berhad–Luton	45,000		
Shell Refining Co. Berhad–Port Dickson	90,000		[1]4,000
			[2]10,000
Total	209,300	....	21,980
MARTINIQUE			
Ste. Anonyme de la Raffinerie des Antilles–Fort-de-France	12,800		[2]7,410

WORLDWIDE REFINING	b/cd Crude capacity	Catalytic cracking	Cat reforming
MEXICO			
Petroleos Mexicanos–Azcapotzalco	110,000	[1]24,000	
Cadereyta	235,000	[1]40,000	[2]20,000
Ciudad Madero	195,000	[1]43,000	[2]15,000
		[3]9,000	
Minatitlan	200,000	[1]24,000	[2]48,000
		[2]16,000	
Poza Rica	50,000		
Reynosa	9,000		
Salamanca	235,000	[1]40,000	[2]24,800
Salina Cruz	165,000	[1]40,000	[2]20,000
Tula, Hidalgo	155,000	[2]40,000	[2]30,000
Total	**1,354,000**	**267,000**	**157,800**
Solvent extraction: [1]38,000 b/cd			
MOROCCO			
Samir–Mohammedia	129,000		[2]24,000
Ste. Cherifienne des Petroles–Sidi Kacem	25,600	[2]5,600	[1]2,800
Total	**154,600**	**5,600**	**26,800**
NETHERLANDS			
BP Raffinaderij Nederland NV–Rotterdam	437,000	[1]47,500	[2]27,000
Esso Nederland BV–Rotterdam	155,000		[4]25,200
Kuwait Petroleum Europoort BV–Rotterdam	75,500		[2]8,200
Shell Nederland Raffinaderij BV–Pernis	348,000	[1]78,000	[2]17,000
			[5]42,000
Smid & Hollander Raffinaderij BV–Amsterdam	8,200		
Texaco Petroleum Mij. (Nederland) BV–Pernis	207,000		[2]29,000
Total Raffinaderij Nederland NV–Vlissingen	150,000		[5]18,000
Total	**1,380,700**	**125,500**	**166,400**
NETHERLANDS ANTILLES			
Refineria Isla Curazao SA–Emmastad	320,000	[1]42,000	[2]15,000
NEW ZEALAND			
New Zealand Refining–Whangarei	88,400		[2]21,900
NICARAGUA			
Esso Standard Oil SA Ltd.–Managua	14,500		[2]2,800
NIGERIA			
Nigerian Petroleum Refining Cl.–Kaduna	104,500	[1]18,000	[2]15,300
Port Harcourt, Alesa Eleme	60,000		[6]6,000
Port Harcourt, Rivers State	150,000	[1]40,000	[5]33,000
Warri	100,000	[1]26,000	[2]16,700
Total	**414,500**	**84,000**	**71,000**
Solvent extraction: [1]9,492 b/cd			
NORWAY			
Esso Norge AS–Slagen-Valloy	90,000		[2]10,000
Norske Shell AS–Sola	60,000		[2]10,000
Rafinor AS–Mongstad	89,400		[2]10,100
Total	**239,400**	....	**30,100**
OMAN			
Oman Refinery Co.–Mina Al Fahal	76,932	....	[2]15,386
PAKISTAN			
Attock Refinery Ltd.–Rawalpindi	36,000		
National Refinery Ltd.–Korangi, Karachi	47,750		[2]2,750
Pakistan Refinery Ltd.–Karachi	46,300		[1]2,700
Total	**130,050**	....	**5,450**

WORLDWIDE REFINING	b/cd Crude capacity	Catalytic cracking	Cat reforming
PANAMA			
Refineria Panama SA–Las Minas	100,000		[2]7,500
PARAGUAY			
Petroleos Paraguayos–Villa Elisa	7,500	....	....
PERU			
Petroleos del Peru:			
Conchan	5,670		
Iquitos, Loreto	9,450		
La Pampilla, Lima	93,900	[1]7,600	[2]1,680
Marsella, Loreto	1,953		
Pucallpa	2,565		
Talara	58,900	[1]14,940	
Total	**172,438**	**22,540**	**1,680**
PHILIPPINES			
Caltex (Philippines) Inc.–Batangas	63,000	[1]8,100	[2]8,100
Petron Corp.–Limay, Bataan	130,000	[2]15,000	[1]23,800
Philippine Petroleum Corp.–Pililla			
Pilipinas Shell Petroleum–Tabangao	61,000		[1]7,500
Total	**254,000**	**23,100**	**39,400**
POLAND			
Government-owned refineries at Czechowice, Gdansk, Glinik Mariampolski, Jasto, Jealicze, Kralaty, L. Warynski, Plock, Trzebinia. Of these, Plock is by far the largest, accounting for roughly 80% of Polish refinery production. Its crude capacity is nearly 300,000 b/d.			
Total	**385,000**		
PORTUGAL			
Petrogal–Lisbon		[2]10,100	
Leça da Palmeira, Porto	88,300		[2]14,200
			[4]10,500
Sines	225,000		[5]27,500
Total	**313,300**	**10,100**	**52,200**
PUERTO RICO			
Bayamon Refinery–Bayamon	38,000	[1]12,000	[2]5,800
Yabucoa Sun Oil Co.–Yabucoa	85,000		
Total	**123,000**	**12,000**	**5,800**
QATAR			
National Oil Distribution Co.–Umm Said	62,000		[2]2,200
			[6]9,830
Total	**62,000**	....	**12,030**
ROMANIA			
Government-owned refineries at Bacau, Borzesti, Brazi, Brazov, Cimpina, Darmanesti, G. Gheorghiu Dej, Navodari, Onesti, Pitesti, Ploesti, Sulpacu, and Telaejen.			
Total	**617,000**		
SAUDI ARABIA			
Arabian American Oil Co.–Ras Tanura	450,000		[6]60,000
Arabian Oil CL–Ras Al Khafji	30,000		
Jeddah Oil Refinery–Jeddah	91,000	[1]10,000	[2]2,900
Petromin-Mobil–Yanbu	250,000	[1]66,000	[5]32,000
Petromin-Shell–Al-Jubail	250,000		[5]17,000
Riyadh Oil Refinery–Riyadh	134,000		[2]28,600
			[5]5,400
Yanbu Domestic Refinery–Yanbu	170,000		[2]35,000
Total	**1,375,000**	**76,000**	**180,900**
Solvent extraction: [1]12,500 b/cd [2]8,800 b/cd			
SENEGAL			
Ste. Africaine de Raffinage–M'Bao (Dakar)	29,800	....	[2]2,870

WORLDWIDE REFINING	b/cd Crude capacity	b/cd Catalytic cracking	b/cd Cat reforming
SIERRA LEONE			
Sierra Leone Petroleum Refining Co –Freetown	10,000	....	....
SINGAPORE			
BP Refinery Singapore PL Pasir Panjang	28,000	....	....
Esso Singapore PL–Pulau Ayer Chawan	170,000	....	[2]8,600
Mobil Oil Singapore PL–Jurong	193,000	....	[2]18,000
Shell Eastern Petroleum Ltd – Pulau Bukom	300,000	....	[2]6,800 [5]13,900
Singapore Refinery CPL†– Pulau Merlimau	161,000	....	[4]11,000
Total	**852,000**	....	**58,300**
†Singapore Petroleum CPL shares percentages of refinery capacities			
SOMALIA			
Iragsoma Ref. Co –Mogadishu	10,000	....	....
SOUTH AFRICA			
Caltex Oil SA PL–Cape Town	90,000	[1]25,000	[2]10,500
Mobil Oil Refining Co.– Southern Africa PL–Durban	65,000	[1]15,000	[2]15,000
†Durban	....	....	....
National Petroleum Refiners of South Africa PL–Sasolburg OFS	78,500	[1]17,400	[2]11,300
Shell and BP South Africa Petroleum Refineries PL–Durban	200,000	[1]27,000	[2]26,000
Total	**433,500**	**84,400**	**62,800**
†South African Oil Refinery PL is owner; Mobil is operator			
SPAIN			
Asfaltos Españoles SA–Tarragona	21,000	....	....
Cia. Española de Petroles–San Roque (Cádiz)	160,000	[1]36,000	[2]35,000
Tenerife	130,000	....	[2]13,000
Petróleos del Mediterraneo– Castellón de la Plana	112,000	[1]14,000	[2]14,000
Petronor SA–Somorrostro, Vizcaya	220,000	[1]40,000	[2]30,500
Repsol Petroleo SA–Cartagena, Murcia	112,000	....	[2]25,000
La Coruña	135,000	[1]28,000	[2]22,000
Puertollano, Ciudad Real	135,000	[1]30,000	[2]18,000
Tarragona	180,000	[2]16,000	....
Unión Explosivos Rio Tinto SA– La Rábida, Huelva	80,000	....	[2]14,100
Total	**1,285,000**	**164,000**	**171,600**
SRI LANKA			
Ceylon Petroleum Corp.– Sapugaskanda	50,000	....	[2]3,750
SUDAN			
Port Sudan Refinery Ltd –Port Sudan	21,440	....	[1]1,700
SWEDEN			
AB Nynas Petroleum–Gothenburg	12,500	....	....
Nynäshamn	28,000	....	....
BP Raffinaderi–Gothenburg	106,000	....	[2]20,500
Shell Raffinaderi BV–Gothenburg	80,000	....	[2]16,000
Skandinaviska Raffinaderi AB– Brofjorden-Lysekil	200,000	[1]25,000	[2]34,500
Total	**426,500**	**25,000**	**71,000**
SWITZERLAND			
Raffinerie de Cressier SA–Cressier	60,000	....	[2]16,000
Raffinerie du Sud-Ouest SA– Collombey	72,000	....	[2]10,000
Total	**132,000**	....	**26,000**

WORLDWIDE REFINING	b/cd Crude capacity	b/cd Catalytic cracking	b/cd Cat reforming
SYRIA			
Banias Refining Co –Banias	126,350	....	[4]16,728
Homs Refinery Co –Homs	117,394	....	[2]2,266
Total	**243,744**	....	**18,994**
TANZANIA			
Tanzanian & Italian Petroleum Refining CL–Kigamboni, Dar es Salaam	13,500	....	[2]3,000
THAILAND			
Esso Standard Thailand Ltd.–Sriracha	64,220	....	[2]7,200
Petroleum Authority of Thailand– Bangchak, Bangkok	61,750	....	[2]9,450
Thai Oil CL–Sriracha	65,075	[1]8,100	[1]9,630
Total	**191,045**	**8,100**	**26,280**
TRINIDAD			
Trinidad and Tobago Oil CL– Pointe-a-Pierre	220,000	[1]28,000	[4]25,000
Point Fortin	80,000	....	[3]6,000
Total	**300,000**	**28,000**	**31,000**
TUNISIA			
Ste. Tunisienne Industries des Raffinage–Bizerte	34,000	....	3,300
TURKEY			
Anadolu Tasfiyehanesi AS–Mersin	90,000	....	[2]10,500
Turkish Petroleum Refineries Corp.			
Aliaga-Izmir[1]	249,000	[1]14,000	[2]10,700
Batman, Siirt	24,350	....	[2]1,300
Izmit	248,455	[1]20,128	[2]20,285
Kirikkale	112,849	....	[2]20,342
Total	**724,654**	**34,128**	**63,127**
Solvent extraction: [1]10,273 b/cd (furfural), 6,938 b/cd (propane deasphalting)			
UNITED KINGDOM			
England			
Conoco Ltd –South Killingholme	130,000	[1]38,000 [2]50,000	....
Eastham Refinery Ltd –Eastham, Cheshire	12,000	....	....
Esso Petroleum CL–Fawley	300,200	[1]76,500	[2]27,900 [4]22,500
Lindsey Oil Refinery Ltd.– Killingholm, South Humberside	190,000	[1]40,000	[2]33,600
Mobil Oil CL–Coryton, Essex	145,000	[1]47,000	[2]27,000
Phillips Imperial Petroleum Ltd.– Port Clarence	100,000	....	....
Shell U.K. Ltd –Shell Haven	92,000	....	[5]34,000
Stanlow	262,000	[1]54,000	[2]29,000 [5]27,000
Total	**1,231,200**	**305,500**	**201,000**
Scotland			
BP Refinery Grangemouth Ltd.– Grangemouth	178,500	[1]19,000	[2]32,000
William Briggs & Sons Ltd —Dundee	6,400	....	....
Total	**184,900**	**19,000**	**32,000**
Wales			
Amoco UK Ltd –Milford Haven	102,000	[1]31,500	[2]17,500
BP Refinery Llandarcy Ltd.– Llandarcy, Neath	105,000	....	[2]18,000
Gulf Oil-GB–Milford Haven		[1]86,000	....
Pembroke Cracking Co. (65% Texaco, 35% Gulf Oil-GB)	180,000	....	[5]39,000
Texaco Ltd.–Pembroke, Dyfed	**387,000**	**117,500**	**74,500**
Total	**1,803,100**	**442,000**	**307,500**
Total United Kingdom			



REFORMER UNIT is part of Citgo Peteroleum Corp.'s refinery in Lake Charles, La. (photo courtesy Citgo Petroleum Corp.).

WORLDWIDE REFINING	b/cd Crude capacity	b/cd Catalytic cracking	b/cd Cat reforming
URUGUAY			
Ancap–La Teja, Montevideo	33,000	[1]4,100	[1]2,500
U.S.S.R.			
Government-owned refineries at Achinsk, Angarsk, Baku, Batumi, Chimkent, Drogobych, Fergana, Gorki, Grozny, Guryev, Ishimbai, Khabarovsk, Kherson, Kirishi, Komsomolsk, Krasnovodsk, Kremenchug, Kuibyshev, Lisichansk, Mazheikiai, Moscow, Mozyr, Nadvornaya, Nizhnekamsk, Odessa, Omsk, Orsk, Pavlodar, Perm, Polotsk, Ryazan, Saratov, Syzran, Tuapse, Ufa, Ukhta, Vannovskiy, Volgograd, and Yaroslavl			
Total	12,300,000		
VENEZUELA			
Corpoven–El Palito, Carabobo	105,000	[1]45,000	[1]6,000
El Toreño, Barinas	4,500	....	....
Puerto La Cruz, Anzoategui	195,100	[1]11,400	....
San Roque, Anzoategui	5,200	....	....
Lagoven–Judibana, Falcon	600,000	[1]76,100	....
Maraven–Punta Cardon, Falcon	291,300	[1]60,600	....
Total	1,201,100	193,100	6,000
VIRGIN ISLANDS			
Hess Oil Virgin Islands Corp.–St. Croix	545,000	....	[2]125,000

WORLDWIDE REFINING	b/cd Crude capacity	b/cd Catalytic cracking	b/cd Cat reforming
YEMEN, N.			
Yemen Hunt Oil Co.–Marib	10,000	....	[1]2,500
YEMEN, S.			
Aden Refinery Co.–Little Aden	161,500	....	[1]10,800
YUGOSLAVIA			
Bosanski Brod[1]	112,835	....	[2]7,612 [5]13,500
Lendava	14,600	....	....
Novi Sad	63,000	....	[2]8,200
Pančevo	108,000	[1]20,750	[2]8,800
Rijeka	160,000	[1]21,300	[2]17,500
Sisak	150,000	[1]10,000	[2]19,000
Zagreb	700	....	....
Total	609,135	52,050	74,612
Solvent extraction: [1]3,300 b/cd (deasphalting)			
ZAIRE			
Sozir–Muanda	16,700	....	[2]3,500
ZAMBIA			
Indeni Petroleum Refinery CL–Bwana Nkubwa Area, Ndola	26,554	....	[2]5,070

UNITED STATES

Survey of operating refineries in the U.S. (state capacities as of January 1, 1989)

State	No. plants	Crude capacity b/cd	Cat cracking Fresh feed	Cat reforming
Alabama	3	138,750	.....	27,000
Alaska	6	217,000	.....	12,000
Arizona	1	5,710	.....	.....
Arkansas	3	58,570	18,500	9,000
California	31	2,278,593	645,500	561,500
Colorado	2	72,000	23,000	16,500
Delaware	1	140,000	65,000	56,000
Georgia	2	36,800	.....	.....
Hawaii	2	129,500	22,000	12,000
Illinois	6	920,600	342,000	294,300
Indiana	4	422,900	159,000	99,000
Kansas	8	344,025	127,000	98,600
Kentucky	2	218,900	100,000	53,000
Louisiana	17	2,274,515	736,500	494,300
Michigan	4	120,100	45,500	33,500
Minnesota	2	285,600	78,000	55,500
Mississippi	5	358,600	2,000	95,800
Montana	4	137,200	50,600	35,500
Nevada	1	4,500	.....	.....
New Jersey	6	464,250	256,000	89,500
New Mexico	3	72,800	27,100	17,400
New York	1	42,750	.....	.....
North Dakota	1	58,000	26,000	12,100
Ohio	4	482,650	176,000	160,600
Oklahoma	6	387,500	136,500	91,000
Oregon	1	15,000	.....	.....
Pennsylvania	8	730,400	239,300	208,820
Tennessee	1	57,000	30,000	10,000
Texas	31	4,058,350	1,616,500	1,150,900
Utah	6	154,500	55,400	29,100
Virginia	1	51,000	27,500	9,750
Washington	7	469,675	102,500	119,800
West Virginia	2	15,500	.....	4,900
Wisconsin	1	32,000	11,000	8,000
Wyoming	5	163,500	64,500	36,850
Total	**188**	**15,418,738**	**5,252,900**	**3,901,920**

U.S. refineries

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
ALABAMA			
Belcher Refining Co.—Mobile Bay	*14,250	.....	.....
Hunt Refining Co.—Tuscaloosa	44,500	.....	[2]6,000
Louisiana Land & Exploration Co.—Saraland	80,000	.....	[2]21,000
Total	**138,750**	**.....**	**27,000**
ALASKA			
Arco Alaska Inc.—Kuparuk	12,000	.....	.....
Prudhoe Bay	14,000	.....	.....
Chevron U.S.A. Inc.—Kenai	22,000	.....	.....
Mapco Petroleum Inc.—North Pole	90,000	.....	.....
Petro Star Inc.—North Pole	7,000	.....	.....
Tesoro Petroleum Corp.—Kenai	72,000	.....	[4]12,000
Total	**217,000**	**.....**	**12,000**
ARIZONA			
Intermountain Refining Cl—Fredonia	5,710	.....	.....
ARKANSAS			
Berry Petroleum Co.—Stevens	3,800	.....	.....
Cross Oil & Refining Co. of Arkansas—Smackover	6,770	.....	.....
Lion Oil Co.—El Dorado[5]	48,000	[1]18,500	[2]9,000
Total	**58,570**	**18,500**	**9,000**
Solvent extraction: [1]5,500 b/d.			
CALIFORNIA			
Anchor Refining Cl—McKittrick	10,000	.....	.....
Atlantic Richfield Co.—Carson	214,000	[1]82,000	[2]48,000
Chemoil Refining Corp.—Signal Hill	14,400	.....	.....
Chevron U.S.A. Inc.—El Segundo	330,000	[1]60,000	[2]60,000
Richmond[1]	270,000	[1]63,000	[2]68,000
Conoco Inc.—Santa Maria	9,500	.....	.....
Edgington Oil Cl—Long Beach	41,600	.....	.....
Exxon Co.—Benicia	128,000	[1]6,000	[3]28,000
Fletcher Oil & Refining Co.—Carson	26,500	[1]10,500	[4]5,000
Golden Bear Division, Witco Chemical Corp.—Oildale	10,818	.....	.....
Golden West Refining Co.—Santa Fe Springs	40,600	[1]13,500	[2]19,000
Huntway Refining Co.—Benicia	8,400	.....	.....
Wilmington	5,500	.....	.....
Kern Oil & Refining Co.—Bakersfield	20,000	.....	[2]3,000
Lunday-Thagard Co.—South Gate	7,700	.....	.....
Mobil Oil Corp.—Torrance	123,000	[1]63,000	[2]36,000
Newhall Refining Co. Inc.—Newhall	18,800	.....	[3]2,500
Oxnard Refinery—Oxnard	*4,275	.....	.....
Pacific Refining Co.—Hercules	*52,250	.....	[2]15,000
Paramount Petroleum Corp.—Paramount	42,700	.....	[2]10,500
Powerine Oil Co.—Santa Fe Springs	*46,550	[1]12,500	[2]8,500
San Joaquin Refining Cl—Bakersfield	18,000	.....	.....
Shell Oil Co.—Martinez	140,100	[1]67,000	[3]28,000
Wilmington	144,000	[1]42,000	[2]24,000
Sunland Refining Corp.—South Gate	15,000	.....	[2]1,500
Texaco Refining & Marketing Inc.—			
Bakersfield	47,000	.....	[2]23,000
Wilmington	75,000	[1]28,000	[2]38,000
Tosco Corp.—Martinez	126,000	[1]55,000	[2]20,000
			[6]23,000
Union Pacific Resources—Wilmington	68,000	[1]38,000	[6]14,500
Unocal Corp.—Los Angeles	108,000	[2]47,000	[2]52,000
Rodeo	112,900	.....	[2]34,000
Total	**2,278,593**	**645,500**	**561,500**
Solvent extraction: [1]50,000 b/sd.			
COLORADO			
Colorado Refining Co.—Commerce City	28,000	[1]8,000	[2]9,000
Conoco Inc.—Commerce City	44,000	[1]15,000	[2]7,500
Total	**72,000**	**23,000**	**16,500**
DELAWARE			
Star Enterprise—Delaware City	140,000	[1]65,000	[2]18,000
			[5]38,000
Total	**140,000**	**65,000**	**56,000**

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
GEORGIA			
Amoco Oil Co.—Savannah	28,000	.....	.....
Young Refining Corp.—Douglasville	8,800	.....	.....
Total	**36,800**	.....	.....
HAWAII			
Chevron U.S.A. Inc.—Barber's Point	48,000	[1]22,000	.....
Hawaiian Independent Refinery Inc.—Ewa Beach	81,500	.....	[2]12,000
Total	**129,500**	**22,000**	**12,000**
ILLINOIS			
Clark Oil & Refining Corp.—Blue Island	64,600	[1]25,000	[2]30,500
Hartford	60,000	[1]26,000	[2]12,000
Marathon Petroleum Co.—Robinson	195,000	[1]41,000	[4]38,000
			[5]41,000
Mobil Oil Corp.—Joliet	180,000	[1]98,000	[2]46,000
Shell Oil Co.—Wood River	274,000	[1]94,000	[2]22,000
			[3]75,000
Unocal Corp.—Lemont	147,000	[1]58,000	[2]29,800
Total	**920,600**	**342,000**	**294,300**
INDIANA			
Amoco Oil Co.—Whiting	350,000	[1]140,000	[2]85,000
Indiana Farm Bureau Cooperative Association Inc.—Mt. Vernon	20,600	.....	[2]4,000
Laketon Refining Corp.—Laketon	8,300	.....	.....
Rock Island Refining Corp.—Indianapolis[1]	44,000	[1]19,000	[1]10,000
Total	**422,900**	**159,000**	**99,000**

Solvent extraction: [3]4,500.

KANSAS			
Coastal Refining and Marketing Inc.—Augusta	.....	.....	[2]10,000
Derby Refining Co.—El Dorado[1]	*28,500	[1]14,500	[2]4,500
Wichita	*29,925	[1]19,000	[2]6,500
Farmland Industries Inc.—Coffeyville	56,500	[1]23,000	[2]16,000
Phillipsburg	26,400	.....	[2]5,300
National Cooperative Refinery Association—McPherson	70,900	[1]20,000	[2]15,000
Texaco Refining & Marketing Inc.—El Dorado	78,200	[1]31,500	[2]25,000
Total Petroleum Inc.—Arkansas City	53,600	[1]19,000	[2]16,000
Total	**344,025**	**127,000**	**98,300**

Solvent extraction: [1]5,600 b/sd.

KENTUCKY			
Ashland Petroleum Co.—Catlettsburg	213,400	[1]60,000	[2]25,000
		§[2]40,000	[5]27,000
Somerset Refinery Inc.—Somerset	5,500	.....	[2]1,000
Total	**218,900**	**100,000**	**53,000**

§Reduced crude converter.

LOUISIANA			
Atlas Processing Co., Division of Pennzoil—Shreveport	46,200	.....	[2]10,000
Calcasieu Refining Co.—Lake Charles	12,000	.....	.....
Calumet Refining Co.—Princeton	4,100	.....	.....
Canal Refining Co.—Church Point	9,865	.....	[1]1,900
Citgo Petroleum Corp.—Lake Charles	320,000	[1]150,000	[2]46,000
			[5]45,000
Conoco Inc.—Westlake	156,500	[1]40,000	[2]15,900
			[5]11,500
Exxon Co.—Baton Rouge[1]	455,000	[1]155,000	[4]90,000
Hill Petroleum Co.—Krotz Springs	55,300	[1]28,000	[2]12,500
St. Rose	33,000	.....	.....
Kerr-McGee Refining Corp.—Cotton Valley	7,800	.....	.....
Marathon Petroleum Co.—Garyville	255,000	[1]85,000	[5]48,000
Mobil Oil Corp.—Chalmette	145,000	[1]51,000	[2]28,000
Murphy Oil USA Inc.—Meraux[2]	92,500	[1]35,000	[5]23,000
Placid Refining Co.—Port Allen[3]	*47,500	[1]18,500	[2]10,000
Shell Oil Co.—Norco	215,000	[1]90,000	[2]18,000
			[3]38,000
Sohio Oil Co.(BP America)—Belle Chasse	*194,750	[1]89,000	[2]37,500
Star Enterprise—Convent	225,000	[1]85,000	[2]40,000
Total	**2,274,515**	**736,500**	**494,300**

Solvent extraction: [1]28,500 b/sd. [2]12,000 b/sd. [3]6,000 b/sd.

MICHIGAN			
Crystal Refining Co.—Carson City	4,000	.....	.....
Lakeside Refining Co.—Kalamazoo	5,600	.....	[1]1,000
Marathon Petroleum Co.—Detroit	68,500	[1]27,000	[2]18,500
Total Petroleum Inc.—Alma	42,000	[1]18,500	[2]14,000
Total	**120,100**	**45,500**	**33,500**
MINNESOTA			
Ashland Petroleum Co.—St. Paul Park	67,100	[1]23,000	[2]23,500
Koch Refining Co.—Rosemount	*218,500	[1]55,000	[5]26,000
			[4]6,000
Total	**285,600**	**78,000**	**55,500**
MISSISSIPPI			
Amerada-Hess Corp.—Purvis	30,000	[2]16,000	[2]5,800
Chevron U.S.A. Inc.—Pascagoula	295,000	[1]56,000	[2]90,000
Ergon Refining Inc.—Vicksburg	16,800	.....	.....
Southland Oil Co.—Lumberton	5,800	.....	.....
Sandersville	11,000	.....	.....
Total	**358,600**	**72,000**	**95,800**
MONTANA			
Cenex—Laurel[1]	40,400	[1]12,000	[2]12,000
Conoco Inc.—Billings[2]	48,500	[1]15,500	[2]12,500
Exxon Co.—Billings	42,000	[1]21,000	[1]10,000
Montana Refining Co.—Great Falls	6,300	[1]2,100	[2]1,000
Total	**137,200**	**50,600**	**35,500**

Solvent extraction: [1]4,000 b/sd. [2]8,500 b/sd (PDA).

NEVADA			
Nevada Refining Co.—Tonopah	4,500	.....	.....
NEW JERSEY			
Amerada-Hess Corp.—Port Reading	.....	[1]50,000	.....
Chevron U.S.A. Inc.—Perth Amboy	80,000	.....	.....
Coastal Eagle Point Oil Co.—Westville	*109,250	[1]50,000	[2]38,000
Exxon Co.—Linden	130,000	[1]120,000	[4]28,000
Mantua Oil Co. LP—Thorofare	45,000	.....	.....
Mobil Oil Corp.—Paulsboro[1]	100,000	[1]36,000	[2]23,500
Total	**464,250**	**256,000**	**89,500**

Solvent extraction: [1]9,500 b/sd.

NEW MEXICO			
Bloomfield Refining Co.—Bloomfield	16,800	[1]5,400	[2]2,800
Giant Industries Inc.—Gallup	18,000	[1]7,200	[2]6,800
Navajo Refining Co.—Artesia	*38,000	[1]14,500	[1]7,800
Total	**72,800**	**27,100**	**17,400**
NEW YORK			
Cibro Petroleum Products Co.—Albany	42,750	.....	.....
NORTH DAKOTA			
Amoco Oil Co.—Mandan	58,000	[1]26,000	[4]12,100
Total	**58,000**	**26,000**	**12,100**
OHIO			
Ashland Petroleum Co.—Canton	66,000	[1]25,000	[5]20,000

Company and refinery location	Crude	Catalytic cracking	Catalytic reforming
Sohio Oil Co. (BP America)—Lima	*171,000	[1]36,000	[5]53,000
Toledo	*120,650	[1]55,000	[3]23,000
			[4]19,000
Sun Co. Inc.-Toledo[1]	125,000	[1]60,000	[4]45,600
Total	**482,650**	**176,000**	**160,600**

Solvent extraction: [1]9,000 b/sd.

OKLAHOMA

Barrett Refining Corp.—Thomas	13,000	.....	.....
Conoco Inc.—Ponca City	136,000	[1]46,000	[2]34,500
Kerr-McGee Refining Corp.—Wynnewood[1]	43,000	[1]20,000	[2]8,500
Sinclair Oil Corp.—Tulsa	50,000	[1]18,000	[2]12,000
Sun Co. Inc.—Tulsa[2]	85,000	[1]30,000	[4]24,000
Total Petroleum Inc.—Ardmore	60,500	[1]22,500	[5]12,000
Total	**387,000**	**136,500**	**91,000**

Solvent extraction: [1]5,000 b/sd. [2]5,900 b/sd.

OREGON

Chevron U.S.A. Inc.—Portland	15,000	.....	.....

PENNSYLVANIA

Atlantic Refining & Marketing Corp.—			
Philadelphia	125,000	[1]29,000	[2]60,000
Chevron U.S.A. Inc.—Philadelphia	174,100	[1]53,300	[2]34,000
Kendall-Amalie Division,			
Witco Chemical Co.—Bradford	8,500	.....	[2]3,300
Pennzoil Products Co.—Rouseville	15,700	.....	[2]5,820
Quaker State Oil Refining Corp.—			
Smethport[1]	6,500	.....	[2]2,100
Sohio Oil Co. (BP America)—Marcus Hook	*171,000	[1]50,000	[5]48,000
Sun Co. Inc.—Marcus Hook	165,000	[1]87,000	[2]39,600
United Refining Co.—Warren	*64,600	[1]20,000	[2]16,000
Total	**730,400**	**239,300**	**208,820**

Solvent extraction: [1]730 b/sd.

TENNESSEE

Mapco Petroleum Inc.—Memphis	*57,000	[1]30,000	[2]10,000
Total	**57,000**	**30,000**	**10,000**

TEXAS

Amoco Oil Co.—Texas City	420,000	[1]195,000	[4]160,000
Champlin Refining Co.—Corpus Christi	150,000	[1]70,000	[5]52,000
Chevron U.S.A. Inc.—El Paso	66,000	[1]22,000	[2]25,000
Port Arthur	329,000	[1]110,000	[2]23,000
			[4]44,100
Coastal Refining & Marketing Inc.—			
Corpus Christi	*90,250	[1]18,500	[2]11,000
			[6]17,500
Crown Central Petroleum Corp.—Houston	100,000	[1]56,000	[2]14,000
			[5]22,000
Diamond Shamrock Corp.—Sunray[1]	105,000	[1]45,000	[2]29,000
Three Rivers[2]	50,000	[1]19,000	[2]11,000
El Paso Refining Co. Ltd.—El Paso	21,000	[1]7,000	[2]5,600
Exxon Co. U.S.A.—Baytown[3]	493,000	[1]155,000	[3]60,000
			[4]63,000
Fina Oil & Chemical Co.—Big Spring[4]	55,000	[1]22,000	[2]20,000
Port Arthur[5]	100,000	[1]36,000	[5]34,000
Hill Petroleum Co.—Houston[6]	67,500	[1]55,000	[2]11,500
Texas City	119,600	[1]43,500	[2]11,000
			[5]12,000
Howell Hydrocarbons Inc.—San Antonio	2,750	.....	[1]1,000
Koch Refining Co.—Corpus Christi	125,000	[1]40,000	[3]15,000
			[5]33,500
LaGloria Oil & Gas Co.—Tyler	55,000	[1]17,000	[2]4,000
			[5]11,700
Liquid Energy Corp.—Bridgeport	10,000	.....	.....
Lyondell Petrochemical Co.—Houston[7]	265,000	[1]90,000	[2]110,000
Marathon Petroleum Co.—Texas City	69,500	[1]38,000	[1]9,000
Mobil Oil Corp.—Beaumont	275,000	[1]102,000	[2]57,000
			[5]46,000
Phillips 66 Co.—Borger	105,000	[1]60,000	[2]26,000
Sweeny	175,000	[1]87,000	[2]36,000
Pride Refining Inc.—Abilene	42,750	.....	.....
Shell Oil Co.—Deer Park	215,900	[1]65,000	[2]20,000
			[3]43,000
Odessa	28,600	[1]10,500	[1]11,000
Southwestern Refining Co.—Corpus Christi	104,000	[1]50,000	[2]30,000
Star Enterprise—			
Port Arthur and Port Neches[8]	250,000	[1]110,000	[5]40,000
Trifinery—Corpus Christi	28,500	.....	.....
Unocal Corp.—(Beaumont), Nederland	120,000	[1]39,000	[1]12,000
			[2]20,000
Valero Refining Co.—Corpus Christi	20,000	†[2]54,000	.....
Total	**4,058,350**	**1,616,500**	**1,150,900**

Solvent extraction: [1]15,000 b/sd. [2]7,000 b/sd. [3]53,000 b/sd. [4]10,000 b/sd. [5]18,000 b/sd. [6]11,000 b/sd. [7]10,200 b/sd. [8]4,000 b/sd.
†Heavy oil cracker.

UTAH

Amoco Oil Co.—Salt Lake City	40,000	[1]18,000	[4]7,600
Big West Oil Co.—Salt Lake City	24,000	[2]5,000	[2]5,000
Chevron U.S.A.—Salt Lake City	45,000	[1]11,000	[2]5,500
		[2]7,000	
Crysen Refining Inc.—Woods Cross	12,500	.....	[2]3,000
Pennzoil Products Co.—Roosevelt	8,000	[1]6,000	[2]2,000
Phillips 66 Co.—Woods Cross[1]	25,000	[2]8,400	[4]6,000
Total	**154,500**	**55,400**	**29,100**

Solvent extraction: [1]5,000 b/sd.

VIRGINIA

Amoco Oil Co.—Yorktown	51,000	[1]27,500	[2]9,750
Total	**51,000**	**27,500**	**9,750**

WASHINGTON

Atlantic Richfield Co.—Ferndale	162,000	.....	[2]56,000
Chevron U.S.A. Inc.—Seattle	5,000	.....	.....
Shell Oil Co.—Anacortes	84,000	[1]41,000	[3]25,000
Sohio Oil Co. (BP America)—Ferndale	77,000	[2]25,500	[4]11,800
Sound Refining Inc.—Tacoma	11,900	.....	.....
Texaco Refining & Marketing Inc.—			
Anacortes[1]	97,000	[1]36,000	[1]7,000
			[2]14,000
U.S. Oil & Refining Co.—Tacoma	*32,775	.....	[2]6,000
Total	**469,675**	**102,500**	**119,800**

Solvent extraction: [1]4,500 b/sd.

WEST VIRGINIA

Mid Atlantic Fuels Inc.			
—St. Mary's—	5,000	.....	[1]1,500
Quaker State Oil Refining Corp.—			
Newell	10,500	.....	[2]3,400
Total	**15,500**	.....	**4,900**

WISCONSIN

Murphy Oil USA Inc.—Superior	32,000	[1]11,000	[2]8,000
Total	**32,000**	**11,000**	**8,000**

WYOMING

Amoco Oil Co.—Casper	40,000	[1]13,500	[4]7,000
Frontier Oil & Refining Co.—Cheyenne	35,000	[1]12,000	[2]6,600
Little America Refining Co.—Casper	22,000	[1]14,000	[4]6,000
Sinclair Oil Corp.—Sinclair	54,000	[1]21,000	[2]14,500
Wyoming Refining Co.—Newcastle	12,500	[4]4,000	[2]2,750
Total	**163,500**	**64,500**	**36,850**

WORLDWIDE GAS PROCESSING

Capacities as of Jan. 1, 1988, and average production

Country	No. plants	MMcfd: Gas capacity	MMcfd: Gas throughput	Production—1,000 gpd (Average based on the past 12 months): Ethane	Prop.	Isobut.	Process or unsplit butane	LP-gas mix	Raw NGL mix	Debut. nat. gaso.	Other	Total products
United States												
Alabama	6	177.0	161.5	16.0	178.5	44.8	100.4		1.2	71.1		412.0
Alaska	4	3,385.5	3,340.3		3.5				2,168.3		16.6	2,188.4
Arkansas	5	943.0	534.1		4.0		4.0		57.4	8.0	3.0	76.4
California	36	1,028.9	753.1		459.9	40.9	255.2	71.5	188.4	282.6	0.6	1,299.1
Colorado	37	925.2	498.4		191.5		42.0	17.7	452.1	41.3	25.5	770.1
Florida	2	790.0	647.0	105.4	138.0	14.0	77.0			75.0		409.4
Kansas	25	5,592.5	3,291.0	468.1	764.2	91.6	266.0	0.9	821.1	202.8	1.1	2,615.8
Kentucky	2	71.0	66.9								162.6	162.6
Louisiana	79	19,492.5	10,766.6	1,590.0	1,135.4	348.9	370.1	5.4	5,658.8	668.8	420.5	10,197.9
Michigan	28	4,744.1	1,439.5		71.5			15.7	730.5	103.8	17.6	939.1
Mississippi	6	901.0	396.7		9.2		8.0		26.1	11.5		54.8
Montana	6	22.0	8.2		23.8	2.2		22.1	25.0	2.1	0.8	76.0
Nebraska	2	3.5	2.2						7.2			7.2
New Mexico	27	3,310.8	2,107.1	213.6	200.7	16.9	65.2		3,687.8	76.0	21.3	4,281.5
North Dakota	9	308.0	213.8		196.0		88.1		83.6	102.6	13.1	483.4
Oklahoma	106	4,571.4	2,785.0	748.1	732.9	108.0	276.0	291.1	3,040.1	367.7	223.1	5,787.0
Pennsylvania	2	14.0	7.9		4.1		3.3			3.9		11.3
Texas	325	17,802.2	11,422.7	3,474.4	3,595.0	531.9	1,524.0	556.5	11,904.0	1,459.1	1,936.8	24,981.7
Utah	11	485.5	246.1		86.1		26.6		146.0	37.2	103.9	399.8
West Virginia	7	399.0	326.0	223.9	140.5	24.0	45.4	80.6	214.8	1.7		730.9
Wyoming	39	2,864.0	2,282.7		279.7	10.7	195.0	77.9	1,701.9	1,020.8	1,762.0	5,048.0
Total U.S.	764	67,831.1	41,296.8	6,839.5	8,214.5	1,233.9	3,346.3	1,139.4	30,914.3	4,536.0	4,708.5	*68,240.4
Abu Dhabi	5	1,602.0	1,269.0							546.0		546.0
Algeria	4	5,335.2	4,268.2					632.8			5,449.2	6,082.0
Argentina	13	1,344.8	1,322.1	694.9	406.8		267.0			425.3		1,794.0
Australia	5	2,573.0	1,342.0	279.0	441.0		249.0	738.0		1,062.0	850.0	3,619.0
Austria	2	19.7	14.4								10.7	10.7
Bahrain	1	168.0	155.0		115.0		100.0			152.0		367.0
Bangladesh	2	240.0	178.0								8.2	8.2
Bolivia	2	474.0	177.3		1.4	2.5		161.7		61.5	136.9	364.0
Brazil	10	437.8	414.7	6.1				618.9	239.4	142.5	49.4	1,056.3
Brunei	2	1,032.0	845.0		7.7				54.4	242.0		304.1
Canada												
Alberta	415	21,905.8	12,328.2	4,894.3	1,762.0	115.4	928.4	905.1	4,877.1	2,504.7	196.3	16,183.3
British Columbia	13	2,294.4	1,250.3		147.3		92.0			75.3	52.5	367.1
Northwest Territories	2	196.0	22.1									
Saskatchewan	19	260.4	166.9	39.2					81.4	0.3	12.4	133.3
Chile	2	470.0	400.0		194.0		124.0			102.8		420.8
China, Taiwan	4	271.0	105.7	41.2	29.8	1.9	16.9		1.6	14.9		106.3
Colombia	5	323.1	201.0	102.5	49.0		57.0	48.3		64.5		321.3
Denmark	1	450.0	240.0								100.0	100.0
Dominican Republic	1										277.2	277.2
Dubai	1	330.0	330.0								772.0	772.0
Ecuador	2	41.0	20.5					97.1		37.3		134.4
Egypt	9	1,449.0	1,338.7					796.5			1,176.8	1,973.3
France	1	570.0	563.0		139.0		132.0			270.0		541.0
Germany	5	399.0	341.0									
Greece	1	10.5	9.4						86.6			86.6
Hungary	12	1,078.1	683.6		50.7	5.8	51.8	124.8	332.6	172.8	415.3	1,153.8
Indonesia	8	630.5	454.5		129.0			51.6	285.2	209.1	305.7	980.6
Italy	17	7,166.0	1,497.0					2.7	53.4	7.6		63.7
Kuwait	1	560.0	448.0		1,722.0		980.0			811.8		3,513.8
Libya	7	1,851.0	1,227.0					37.8	5,577.0		551.0	6,165.8
Malaysia	2	282.0	120.0		140.0	120.0		55.0		150.0		465.0
Mexico	10	4,334.0	3,249.0	3,487.7	5,657.2	3.5	153.0	385.4		316.5	14.0	10,017.3
Netherlands	1	440.0	96.0								4.9	4.9
New Zealand	3	852.0	94.0		39.0					9.0		48.0
Norway	2	950.0	455.0		785.0	102.0	262.0		251.0	197.0		1,597.0
Oman	8	626.0	309.0						202.0	43.0		245.0
Pakistan	6	1,095.0	923.0					37.0			12.1	49.1
Peru	2	70.0	37.0		3.4		1.0	5.6	28.9		4.0	42.9
Qatar	2	579.0	229.0		452.0		278.2			202.0		932.2
Saudi Arabia	5	4,300.0							1,176.0			1,176.0
Sharjah	2	990.0	960.4		220.5		251.2				1,341.4	1,813.1
Spain	3	428.0	93.0								94.0	94.0
United Kingdom	10	4,070.2	1,535.5		332.0		291.0		36.0	1,748.5	82.3	2,489.8
Venezuela	14	2,913.0	2,557.0	213.3	197.4		113.4	231.3	3,274.6	171.9		4,201.9
Total, outside U.S.	643	75,411.5	42,270.5	9,758.2	13,021.2	351.1	4,347.9	4,929.6	16,557.2	9,740.3	11,916.3	70,621.8

*Includes data reported only in aggregate form and, therefore, excluded from state-by-state figures above.